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 Zazopoulos, Emmanuel
 Staffa, Alfredo

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<400> 2

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Leu	Val	Pro	Leu	Val	Ala	Tyr	Leu	Ile	Val	Thr	Ser	Leu	Asp	Ile	Arg	20	25	30	
Arg	Ala	His	Asp	Arg	Tyr	Gln	Ala	Gln	Cys	Ala	Ser	Ile	Gly	Asn	Cys	35	40	45	
Ala	Glu	Ala	Met	Leu	Gln	Phe	Gln	Asn	Asp	Phe	Arg	Thr	Arg	Leu	Leu	50	55	60	
Leu	Leu	Ala	Ile	Leu	Leu	Ala	Ala	Ile	Pro	Gly	Ile	Leu	Gly	Val	Phe	65	70	75	80
Trp	Gly	Ala	Pro	Leu	Val	Ala	Arg	Glu	Leu	Glu	Thr	Gly	Thr	His	Arg	85	90	95	
Leu	Val	Trp	Asn	Gln	Ser	Val	Thr	Arg	Arg	Arg	Trp	Leu	Ala	Val	Lys	100	105	110	
Val	Leu	Phe	Val	Gly	Val	Ala	Ala	Met	Ala	Val	Ala	Thr	Leu	Val	Ser	115	120	125	
Thr	Leu	Leu	Thr	Trp	Ala	Ser	Ser	Pro	Val	Asp	Ala	Val	Ser	Gln	Asp	130	135	140	
Arg	Phe	Gly	Ala	Leu	Val	Phe	Asp	Ala	Arg	Asn	Ile	Val	Pro	Val	Ala	145	150	155	160
Tyr	Ala	Ala	Phe	Ala	Leu	Val	Leu	Gly	Thr	Val	Ile	Gly	Leu	Leu	Val	165	170	175	
Arg	Arg	Thr	Ile	Pro	Ala	Met	Ala	Leu	Thr	Met	Leu	Val	Phe	Ala	Val	180	185	190	
Val	Gln	Phe	Thr	Val	Pro	Ala	Leu	Ala	Arg	Pro	His	Leu	Met	Ala	Pro	195	200	205	
Glu	Thr	Gln	Thr	Arg	Gln	Met	Thr	Leu	Gln	Glu	Phe	Gly	Glu	Val	Arg	210	215	220	
Gly	Phe	Gly	Asp	Glu	Pro	Thr	Val	Asn	Gly	Leu	Ser	Ile	Arg	Gly	Ala	225	230	235	240
Trp	Val	Thr	Ser	Thr	Ser	Pro	Leu	Leu	Thr	Ala	Asp	Gly	Thr	Arg	Leu	245	250	255	
Asp	Lys	Ala	Thr	Tyr	Arg	Lys	Cys	Val	Thr	Asp	Pro	Pro	Ala	Val	Ser	260	265	270	
Gly	Gly	Ala	Pro	Gly	Val	Gly	Gly	Thr	Val	Ala	Cys	Leu	Ala	Asp	Leu	275	280	285	

Asp Leu His Val Glu Val Ala Tyr Gln Pro Asn Asp Arg Tyr Trp Thr
290 295 300

Phe Gln Trp Ile Glu Ser Ala Leu Tyr Leu Ala Leu Gly Gly Leu Leu
305 310 315 320

Leu Ala Val Gly Leu Trp Arg Ile Arg Arg His Val Ile
325 330

<210> 3

<211> 304

<212> PRT

<213> Actinoplanes sp.

<400> 3

Met Pro His Glu Asp Ser Ser Pro Val Leu Gln Ala Glu Gly Leu Thr
1 5 10 15

Lys Arg Tyr Gly Arg Arg Thr Ala Leu Gln Asp Cys Asn Leu Thr Ile
20 25 30

Pro Arg Gly Arg Val Ile Gly Leu Val Gly Pro Asn Gly Ala Gly Lys
35 40 45

Ser Thr Leu Leu Gln Leu Ala Cys Gly Leu Ile Thr Pro Ser Glu Gly
50 55 60

Ser Leu Arg Val Leu Gly Glu Thr Pro Ala Ala Asn Ala Gly His Leu
65 70 75 80

Ala Lys Val Gly Phe Val Ala Gln Asp Thr Pro Val Tyr Ser Asn Phe
85 90 95

Thr Val Gly Asp His Leu Lys Met Gly Ala Lys Leu Asn Pro Thr Trp
100 105 110

Asp Gln Ala Leu Ala Glu Arg Arg Val Ala Gln Val Gly Leu Asn His
115 120 125

Gly Gln Lys Ala Gly Arg Leu Ser Gly Gly Gln Arg Ala Gln Leu Ala
130 135 140

Leu Thr Leu Ala Ala Ala Lys Arg Pro Glu Leu Leu Met Phe Asp Glu
145 150 155 160

Pro Ala Ala Ala Leu Asp Pro Leu Ala Arg Asp Gly Phe Leu Gln Asn
165 170 175

Leu Leu Glu Phe Val Thr Glu Leu Asp Ala Ser Ala Ile Leu Ser Ser
180 185 190

His Leu Leu Gly Asp Val Glu Arg Val Cys Asn Tyr Leu Ile Val Leu
195 200 205

Cys Ala Ser Arg Val Gln Val Ala Gly Asp Val Pro Asp Leu Leu Asn
210 215 220

Thr His Tyr Arg Ile Val Ala Pro Arg Gly Glu Leu Asp His Pro Pro
225 230 235 240

Ala Gly Leu Glu Val Ile Arg Ala Gln His Ala Asp Arg Tyr Thr Thr
245 250 255

Ala Val Val Arg Gly Asp Gly Ser Arg Pro Ser Thr Trp Thr Ile Glu
260 265 270

Pro Ile Gln Leu Glu Glu Leu Val Leu Ala Tyr Met Thr Arg Ala Met
275 280 285

Gly Val Thr Gly Glu Pro Leu Met Ala Ala Ser Gly Glu Val Val Arg
290 295 300

<210> 4

<211> 336

<212> PRT

<213> Actinoplanes sp.

<400> 4

Met Ser Trp Arg Gln Phe Arg Gly Gln Ala Val Val Gly Val Val Val
1 5 10 15

Leu Ala Leu Leu Ala Ala Tyr Leu Val Tyr Leu Gly Val Asp Ile Arg
20 25 30

Gly Ala Tyr Asp Asp Tyr Arg Ala Gln Cys Pro Ala Gly Gly Asp Cys
35 40 45

Ala Gly Pro Leu Gly Gln Phe Ser Leu Asp Tyr Glu Asn Thr Leu Leu
50 55 60

Tyr Leu Ala Gly Val Leu Ala Leu Val Pro Gly Leu Leu Gly Met Phe
65 70 75 80

Trp Gly Ala Pro Leu Ile Thr Arg Glu Leu Glu Asn Gly Thr Gln Arg
85 90 95

Leu Val Trp Asn Gln Ser Val Thr Arg Arg Arg Trp Leu Leu Ile Lys
100 105 110

Leu Leu Val Val Gly Leu Ala Cys Met Val Val Ala Gly Val Pro Ser
115 120 125

Leu Leu Leu Thr Trp Ala Ala Ala Pro Val Asp Asn Val Ala Asp Asn
130 135 140

Arg Phe Ser Thr Val Met Phe Gly Ala Arg Phe Leu Pro Pro Ile Ala
145 150 155 160

Tyr Ala Ala Phe Ala Phe Val Leu Gly Thr Leu Ile Gly Leu Leu Val
165 170 175

Arg Arg Thr Val Pro Ala Met Ala Leu Thr Leu Val Ala Phe Val Ile
180 185 190

Phe Gln Phe Leu Val Pro Asn Leu Val Arg Pro His Leu Met Pro Ala
195 200 205

Lys His Leu Val Lys Pro Met Thr Val Ser Ala Ile Asn Glu Ala Lys
210 215 220

Ser Leu Gly Ser Ile Thr Gly Ala Pro Val Leu Asn Gly Leu Ser Ile
 225 230 235 240

Ser Gln Gly Trp Ile Thr Asp Val Ser Ala Leu Lys Thr Ala Asp Gly
 245 250 255

Arg Ser Leu Asp Ala Lys Thr Phe Asp Asn Cys Tyr Met Asn Ala Pro
 260 265 270

Lys Thr Gly Ala Thr Glu Gly Pro Tyr Gly Asp Val Ala Val Cys Leu
 275 280 285

Ala Lys Leu Asp Leu His Val Asp Ile Ala Tyr Gln Pro Trp Asn Arg
 290 295 300

Tyr Trp Ala Phe Gln Phe Leu Glu Ser Gly Phe Tyr Val Leu Leu Ser
 305 310 315 320

Gly Leu Leu Ile Gly Ala Ala Val Trp Arg Val Gln Arg Arg Pro Ser
 325 330 335

<210> 5
 <211> 283
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will contain a methionineresidue at t
 his position

<400> 5

Val Arg Ser Ala Val Val Val Gly Thr Gly Leu Ile Gly Thr Ser Val
 1 5 10 15

Gly Leu Ala Leu Thr Gln Arg Asp Ile Thr Val His Leu Leu Asp Ala
 20 25 30

Asp Pro Ala Ala Ala Arg Ala Ala Ala Ala Leu Gly Ala Gly Ile Ala
 35 40 45

Gly Glu Pro Arg Thr Arg Val Asp Val Ala Val Ile Ala Val Pro Pro
 50 55 60

Ala Ala Val Ala Pro Val Leu Ala Asp Leu Gln Arg Arg Gly Thr Ala
 65 70 75 80

Arg Val His Thr Asp Ala Ala Ser Val Lys Val Leu Pro Ser Arg Gln
 85 90 95

Ile Glu Val Leu Gly Cys Asp Ala Ser Ser His Val Gly Gly His Pro
 100 105 110

Leu Ala Gly Ser Glu Arg Ser Gly Pro His Ala Ala Arg Gly Ser Leu
 115 120 125

Phe Glu Gly Arg Pro Trp Val Leu Ser Pro Gly Arg Arg Ser Ser Thr
130 135 140
Ala Ala Val Asp Gly Ala Leu Ala Val Val Ser Ala Cys Gly Ala Thr
145 150 155 160
Pro Val Leu Met Ser Ala Glu Glu His Asp Arg Ala Val Ala Leu Val
165 170 175
Ser His Val Pro His Leu Val Ala Gly Leu Leu Ala Ala Arg Met Leu
180 185 190
Asp Gly Thr Pro Ala Gln Leu Gly Leu Ala Gly Gln Gly Val Arg Asp
195 200 205
Thr Thr Arg Ile Ala Gly Gly Arg Ala Ala Leu Trp Thr Glu Ile Leu
210 215 220
Ala Ala Asn Ala Gly Ala Val Ala Asp Val Leu Asp Asp Leu Ser Ala
225 230 235 240
Glu Leu Ala Ala Thr Ile Ser Ala Leu Arg Glu Leu Glu Ala His Pro
245 250 255
Gly Arg Ala Glu Ala Leu Ala Ala Leu Thr Gly Met Leu Gln Arg Gly
260 265 270
Val Asp Gly Arg Asp Arg Ile Ala Ala Ser Pro
275 280
<210> 6
<211> 336
<212> PRT
<213> Actinoplanes sp.
<400> 6
Met Glu Ser Leu His Ile Ala Ser Ala Arg His Glu Pro Asp Arg His
1 5 10 15
Asp Glu Thr Gln Met Asn Thr Pro Ser Met Met Arg Val Glu Trp Leu
20 25 30
Pro Val Asp Ser Leu Glu Met Leu Asp Ser Pro Arg Leu Ala Gly Glu
35 40 45
Asp Pro Arg His Thr Gln Met Leu Ala Ser Leu Asp Ala Glu Leu Pro
50 55 60
Pro Ile Ile Val His Arg Ala Ser Met Arg Val Ile Asp Gly Ala His
65 70 75 80
Arg Leu Gly Ala Ala Arg Leu Arg Gly Asp Glu Leu Ile Lys Ala Ala
85 90 95
Met Phe Glu Gly Ser Glu Gln Glu Ala Phe Val Leu Gly Val Lys Ala
100 105 110
Asn Ile Ala His Gly Leu Pro Leu Ser Thr Ala Asp Arg Thr Arg Ala
115 120 125

Ala Glu Arg Ile Ile Glu Ser His Pro Ser Trp Ser Asp Arg Thr Ile
 130 135 140
 Ala Ala Ser Ser Gly Leu Ser Ala Arg Thr Val Gly Asn Ile Arg Arg
 145 150 155 160
 Arg Leu Glu Leu Ser Gly Asp Ile Gly Gln Gly Ser Arg Thr Arg Val
 165 170 175
 Gly Arg Asp Gly Arg Val Arg Pro Leu Asp Asn Ser Glu Gly Arg Leu
 180 185 190
 Lys Ala Val Ser Tyr Ile Gln Gln Gln Pro Asp Ala Ser Leu Arg Glu
 195 200 205
 Ile Ala Lys Asn Ala Gly Val Ser Pro Ser Thr Ala Arg Asp Val Arg
 210 215 220
 Asn Arg Leu Gln Arg Gly Glu Asp Pro Leu Pro Gly Pro Arg Arg Thr
 225 230 235 240
 Gly Gly His Arg Asp Asp Ile Ser Phe Asp Lys Glu Asn Thr Ile Arg
 245 250 255
 Leu Leu Glu Pro Thr Val Arg Ser Ile Leu Gln Gly Leu Lys Asn Asp
 260 265 270
 Pro Ser Leu Arg Phe Thr Glu Ser Gly Arg Asn Leu Leu Arg Trp Val
 275 280 285
 Leu Ala Arg Thr Val Gln Asp Asp Glu Trp Lys Asp Met Leu Asp Ala
 290 295 300
 Val Pro Ser His Cys Thr Tyr Val Leu Ala Asn Val Ala Arg Arg Cys
 305 310 315 320
 Ser Gln Glu Trp Leu Glu Phe Ala Glu Thr Leu Glu Lys Asn Ala Ala
 325 330 335
 <210> 7
 <211> 444
 <212> PRT
 <213> Actinoplanes sp.
 <400> 7
 Met Ser Ile Leu Arg Glu Ala Pro Gly Thr Gly Arg Val Leu Arg Arg
 1 5 10 15
 Glu Asp Leu His Gln Ser Leu Ser Asp Pro Leu Leu Asp Thr Met Asn
 20 25 30
 Phe Leu Asn Glu Val Thr Ala Arg Tyr Pro Arg Ala Val Ser Phe Ala
 35 40 45
 Pro Gly Arg Pro Phe Asp Gly Phe Phe Asp Val Glu Gln Ile Phe Arg
 50 55 60
 Gly Ile Arg Gly Tyr Leu Glu His Leu Ala Gly Gln Gly Arg Ser Pro
 65 70 75 80

Ala Glu Ile Arg Asp Ala Val Phe Gln Tyr Gly Pro Ala Ala Gly Arg
 85 90 95
 Ile Arg Glu Val Ile Ala Gln Trp Leu Arg Arg Asp Glu Gly Ile Asp
 100 105 110
 Val Ala Pro Glu Ser Ile Val Val Thr Val Gly Ala Gln Glu Ala Met
 115 120 125
 Leu Leu Ala Leu Arg Ala Leu Ile Arg Asp Glu Arg Asp Ala Leu Phe
 130 135 140
 Val Ala Ser Pro Cys Tyr Val Gly Ile Thr Gly Ala Ala Arg Leu Leu
 145 150 155 160
 Asp Ile Asp Pro Val Pro Val Ala Glu Arg Glu Asp Gly Phe His Pro
 165 170 175
 Glu Asp Leu Ala Arg Ala Val His Ala Glu Leu Ser Arg Gly Arg Arg
 180 185 190
 Pro Arg Ala Phe Tyr Val Val Pro Asp His Thr Asn Pro Ser Gly Ala
 195 200 205
 Thr Met Pro Leu Glu Ala Arg His Ala Leu Leu Asp Leu Ala Gly Glu
 210 215 220
 Leu Gly Leu Leu Val Ile Glu Asp Ser Pro Tyr Arg Leu Val Ser Pro
 225 230 235 240
 Gly Gln Gln Leu Pro Ser Leu Lys Ala Leu Asp Pro Gly Arg His Val
 245 250 255
 Val His Leu Gly Ser Phe Ser Lys Thr Leu Phe Pro Gly Ala Arg Val
 260 265 270
 Gly Phe Ala Ile Ala Asp Gln Pro Val Ser Asp Ala Ala Gly Gly Ala
 275 280 285
 Gly Leu Leu Ala Asp Glu Leu Ala Lys Val Lys Ser Met Val Thr Val
 290 295 300
 Asn Thr Ser Pro Leu Ser Gln Ala Ala Val Ala Gly Met Leu Leu Ala
 305 310 315 320
 Ala Gly Gly Thr Ala Ala Glu Ala Ser Ala Glu Ser Ser Ala His Tyr
 325 330 335
 Gly Ala Ala Met Arg Arg Thr Leu Asp Arg Leu Glu Glu His Leu Pro
 340 345 350
 Ala Ser Phe Arg Ala Arg Thr Gly Val Arg Trp Asn Arg Pro Ser Gly
 355 360 365
 Gly Phe Phe Leu Ala Val Asn Val Pro Phe Thr Ala Asp Asn Ala Ala
 370 375 380
 Leu Ser Arg Ser Ala Glu Asp His Gly Val Ile Trp Thr Pro Met Ser
 385 390 395 400
 Tyr Phe Tyr Pro Ala Gly Gly Gly Glu Gln Gly Ile Arg Leu Ser Ile

405 410 415
 Ser Tyr Leu Thr Pro Glu Glu Ile Asp Glu Gly Val Lys Arg Leu Ala
 420 425 430

 Gly Phe Ile Thr Thr Glu Ile Ala Ala Leu Arg Pro
 435 440

 <210> 8
 <211> 356
 <212> PRT
 <213> Actinoplanes sp.

 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

 <400> 8

 Val Thr Ala Thr Ala Leu Leu Pro Leu Thr Leu Ala Asp Tyr Glu Gln
 1 5 10 15

 Leu Ala Gln Ala Arg Met Glu Pro Pro Val Trp Asp Phe Ile Ala Gly
 20 25 30

 Gly Ala Gly Glu Glu Leu Thr Leu Ala Ala Asn Thr Ala Ala Phe Ala
 35 40 45

 Pro Pro Arg Leu Arg Pro Arg Val Leu Thr Gly Ala Gly Ala Pro Asp
 50 55 60

 Thr Gly Thr Thr Ile Leu Gly Arg Arg Trp Ala Ala Pro Ile Gly Val
 65 70 75 80

 Ala Pro Leu Gly Tyr His Thr Leu Val Asp Pro Ala Gly Glu Val Ala
 85 90 95

 Thr Ala Ala Ala Ala Gly Ala Ala Gly Leu Pro Leu Val Val Ser Thr
 100 105 110

 Phe Ser Gly Arg Thr Val Glu Asp Ile Ala Ala Ala Thr Thr Ala Pro
 115 120 125

 Arg Trp Leu Gln Val Tyr Cys Phe Arg Asp Arg Ala Val Thr Ala Ala
 130 135 140

 Leu Val Thr Arg Ala Val Arg Ala Gly Phe Glu Ala Leu Val Leu Thr
 145 150 155 160

 Val Asp Ala Pro Arg Leu Gly Arg Arg Leu Arg Asp Ile Arg Asn Asp
 165 170 175

 Phe Arg Leu Pro Pro Gly Val Ala Pro Ala Asn Leu Thr Gly Asp Gly
 180 185 190

 Phe Ala Ser Pro Ser Gly His Ala Leu Gly Ala Phe Asp Ala Ala Met
 195 200 205

Asp Trp Thr Val Val Ala Trp Leu Arg Glu Leu Ser Gly Leu Pro Val
 210 215 220
 Leu Leu Lys Gly Val Leu Thr Ala Asp Gly Ala Arg Arg Ala Leu Asp
 225 230 235 240
 Ala Gly Ala Asp Gly Ile Val Val Ser Asn His Gly Gly Arg Gln Leu
 245 250 255
 Asp Gly Val Pro Ala Thr Leu Asp Val Leu Pro Glu Val Val Ala Ala
 260 265 270
 Val Ala Gly Arg Cys Pro Val Leu Leu Asp Gly Gly Val Arg Arg Gly
 275 280 285
 Arg Asp Val Leu Leu Ser Leu Ala Leu Gly Ala Asp Ala Val Leu Val
 290 295 300
 Gly Arg Pro Val Leu Tyr Gly Leu Ala Val Gly Gly Thr Ala Gly Val
 305 310 315 320
 Arg His Val Leu Asp Ile Leu Ala Gly Glu Leu Thr Asp Asp Met Ala
 325 330 335
 Leu Ala Gly Val Ala Ser Pro Ala Asp Ala Gly Ala Asp Leu Ala Gly
 340 345 350
 Pro Val Ala Pro
 355

<210> 9
 <211> 640
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine at this
 position

<400> 9

Val Ala Thr Ile Asp Gly Pro Asp Leu Gly Val Ile Gly Leu Arg Val
 1 5 10 15
 Asp Gly Leu Ile Pro Met Gln Lys Val Arg Pro Gly Thr Val Arg Arg
 20 25 30
 Ile Leu Pro Tyr Ala Lys Lys His Arg Trp Ser Leu Ala Val Ala Leu
 35 40 45
 Leu Met Thr Val Val Asp Ala Ala Leu Thr Val Ala Asn Pro Leu Leu
 50 55 60
 Leu Lys Gln Ile Ile Asp Arg Gly Ile Val Ala Gly Arg Leu Asp Val
 65 70 75 80

Val Val Gly Leu Ser Leu Val Val Ala Gly Leu Ala Leu Val Asn Val
 85 90 95
 Ala Ala Ile His Val Gln Thr Leu Ala Ser Gly Arg Val Gly Gln Gly
 100 105 110
 Leu Ile Tyr Asp Leu Arg Thr Lys Val Phe Ala His Val Met Arg Gln
 115 120 125
 Pro Leu Ala Phe Phe Thr Arg Ala Gln Thr Gly Ser Leu Val Ser Arg
 130 135 140
 Leu Asn Thr Asp Val Val Gly Ala Glu Gln Ala Met Thr Ser Met Ile
 145 150 155 160
 Thr Gln Thr Val Ser Thr Val Leu Thr Val Val Leu Val Ile Gly Ala
 165 170 175
 Met Phe Tyr Leu Ser Trp Ala Ile Ala Leu Val Ala Leu Val Leu Ile
 180 185 190
 Pro Leu Phe Phe Leu Pro Gly Lys Leu Ile Ala Gly Arg Leu Glu Arg
 195 200 205
 Leu Ala Arg Gly Gly Met Gln Val Asp Ala Glu Leu Gly Ser Met Met
 210 215 220
 Asn Glu Arg Phe Asn Val Ser Gly Ala Met Leu Val Lys Leu Tyr Gly
 225 230 235 240
 Arg Pro Glu Ser Glu Glu Thr Ala Phe Ala Gly Arg Ala Ala Arg Val
 245 250 255
 Arg Asp Ile Ala Ile Ser Met Gly Val His Ala Arg Leu Leu Phe Ile
 260 265 270
 Ile Ala Thr Leu Leu Thr Thr Val Thr Thr Ala Met Val Tyr Gly Phe
 275 280 285
 Gly Gly Ala Leu Val Ile Asp Gly Thr Leu Gly Ile Gly Thr Leu Val
 290 295 300
 Ala Met Val Ala Leu Leu Ala Gln Leu Tyr Gly Pro Val Asn Gln Leu
 305 310 315 320
 Thr Asn Ile Gln Val Asp Val Val Thr Ala Leu Val Ser Phe Asp Arg
 325 330 335
 Val Phe Glu Val Leu Asp Leu Asp Pro Leu Val Lys Glu Arg Pro Gly
 340 345 350
 Ala Arg Ala Leu Pro Ala Ala Glu Pro Gly Arg Ser Ala Ala Pro Asp
 355 360 365
 Ile Glu Phe Asp Asn Val Val Phe Arg Tyr Pro Gly Ala Asp Glu Val
 370 375 380
 Ser Leu Ala Ser Leu Glu Thr Val Ala Gln Arg Ser Ser Asp Gly Thr
 385 390 395 400
 Ala Glu Arg Pro Val Leu Asn Gly Ile Ser Phe Leu Ala Pro Ala Gly

405 410 415
 Lys Leu Thr Ala Leu Val Gly Pro Ser Gly Ala Gly Lys Thr Thr Ile
 420 425 430
 Thr His Leu Val Pro Arg Leu Tyr Asp Thr Thr Ser Gly Thr Val Arg
 435 440 445
 Ile Ala Gly His Asp Val Arg Asp Leu Thr Leu Arg Ser Leu Ser Glu
 450 455 460
 Ser Ile Gly Val Val Thr Gln Asp Ala His Leu Phe His Asp Thr Ile
 465 470 475 480
 Arg Ala Asn Leu Leu Tyr Gly Arg Pro Asp Ala Gly Glu Arg Asp Leu
 485 490 495
 Val Ala Ala Cys Glu Ala Ala Arg Ile Trp Glu Met Val Ser Ser Leu
 500 505 510
 Pro Asp Gly Leu Asp Thr Val Val Gly Asp Arg Gly Tyr Arg Leu Ser
 515 520 525
 Gly Gly Glu Lys Gln Arg Leu Ala Leu Ala Arg Leu Leu Leu Lys Ser
 530 535 540
 Pro Pro Val Val Val Leu Asp Glu Ala Thr Ala His Leu Asp Ser Glu
 545 550 555 560
 Ser Glu Ala Ala Ile Gln Arg Ala Leu Asp Thr Ala Leu Ala Gly Arg
 565 570 575
 Thr Ser Leu Val Ile Ala His Arg Leu Ala Thr Ile Leu Asp Ala Asp
 580 585 590
 Gln Ile Leu Val Ile Asp Asp Gly Arg Val Val Glu Arg Gly Thr His
 595 600 605
 Asp Glu Leu Ile Ala His Gly Gly Leu Tyr Ala Glu Leu Tyr Arg Thr
 610 615 620
 Gln Phe Ala Gly Gln Arg Thr Glu Glu Arg Gln Pro Ala Val Pro Ser
 625 630 635 640

<210> 10

<211> 271

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 10

Val Ser Ala Ala Gly Ser Gly Phe Val Thr Thr Asn Gly Val Arg Leu
 1 5 10 15

Ala Tyr Arg Arg Ser Gly Ala Gly Glu Pro Val Leu Met Ile Met Gly
 20 25 30
 Ser Gly Ser Ala Gly Gln Thr Trp Thr Val His Gln Thr Pro Ala Leu
 35 40 45
 His Glu Ala Gly Tyr Ser Thr Val Val Phe Asp Ser Arg Gly Ile Pro
 50 55 60
 Pro Ser Asp Val Pro Ala Gly Lys Tyr Ser Leu Ala Asp Met Thr Ala
 65 70 75 80
 Asp Thr Arg Gly Leu Ile Glu Ala Leu Asp Leu Ala Pro Cys Arg Ile
 85 90 95
 Val Gly Thr Ser Leu Gly Ala Met Ile Ala Gln Glu Leu Ala Val Asp
 100 105 110
 His Pro Glu Leu Val Arg Cys Ala Val Leu Ile Ala Thr Leu Ala Arg
 115 120 125
 Pro Asp Ala Ala Arg Ala Ala Gln Asn Gln Ala Asp Ile Asp Leu Leu
 130 135 140
 Glu Ser Gly Val Thr Leu Pro Ala Ala Tyr Glu Ala Ala Thr Ala Val
 145 150 155 160
 Phe Lys Met Phe Ser Pro Ala Thr Leu Asn Asp Asp Val Ala Val Arg
 165 170 175
 Glu Trp Leu Asp Ile Phe Glu Leu Ser Gly Thr Gly Val Ser Ala Gly
 180 185 190
 Gly Gln Ala Trp Ala Glu Leu Thr Gly Asp Arg Arg Ala Ala Leu Arg
 195 200 205
 Ser Val Thr Ala Pro Cys Arg Val Ile Ser Phe Ala Asp Asp Leu Ile
 210 215 220
 Thr Pro Pro His Leu Ala Ala Glu Val Ala Glu Ala Ile Pro Asp Cys
 225 230 235 240
 Asp Leu Val Glu Ile Ser Arg Cys Gly His Leu Gly Tyr Leu Glu Arg
 245 250 255
 Pro Asp Ala Val Asn Ala Ala Ile Leu Glu Phe Leu Asp Ser His
 260 265 270

<210> 11
 <211> 529
 <212> PRT
 <213> Actinoplanes sp.

<400> 11

Met Gly Asn Ala Asp Gln Pro Arg Tyr Leu Arg Ser Asn Val Ile Ala
 1 5 10 15
 Glu Pro Leu Val Asp Arg Phe Tyr Ala Trp Leu His Thr Val Ala Pro
 20 25 30

Val	Pro	Ala	Ser	Met	Asn	Leu	Ala	Phe	Leu	Gln	Val	Pro	Leu	Leu	Glu	
	35						40					45				
Ser	Tyr	Leu	Gln	Ser	Pro	Pro	Val	His	Val	Ala	Ala	Ser	Thr	Asn	Pro	
	50					55				60						
Lys	Met	Arg	Gly	Gly	Tyr	Phe	Val	Ala	Val	Glu	Glu	Ser	Arg	Ser	Asp	
65					70					75					80	
Glu	Val	Ala	Glu	Leu	Leu	Lys	Thr	Ile	Lys	Asn	Glu	Arg	Ala	Asp	Met	
			85						90					95		
Leu	Gly	Phe	Ala	Ala	Ala	Val	Ala	Glu	Ala	Glu	Asp	Leu	Ile	Arg	Glu	
			100					105					110			
Asn	Ala	Val	Gly	Tyr	Asp	Leu	Thr	Pro	Leu	Tyr	Pro	Arg	Leu	Pro	Ala	
	115						120					125				
Ala	Leu	Asn	Gly	Leu	Val	Glu	Ile	Ala	Tyr	Asp	Thr	Ser	Asn	Gln	Pro	
	130					135					140					
Ser	Leu	His	Phe	Leu	Glu	Pro	Leu	Leu	Tyr	Arg	Ser	Pro	Ala	Tyr	Asp	
145					150					155					160	
Glu	Arg	Arg	Gln	Ser	Val	Gln	Leu	Ser	Leu	Asp	Asp	Gly	Val	Glu	Arg	
				165					170					175		
Pro	Phe	Ile	Leu	Ser	Thr	Pro	Arg	Leu	Pro	Arg	Ala	Gly	Val	Leu	Asp	
			180					185					190			
Leu	Pro	Leu	Pro	Leu	Arg	His	Pro	Gly	Leu	Thr	Glu	Leu	Phe	Asp	Ala	
		195					200					205				
Arg	Val	Arg	Pro	Thr	Ser	Leu	Asn	Arg	Leu	Arg	Glu	Ala	Leu	Glu	Leu	
	210					215					220					
Asp	Asp	Ala	Gly	Ala	Ala	Ala	Leu	Asp	Ala	Leu	Leu	Thr	Asp	Glu	Pro	
225					230					235					240	
Ser	Leu	Ser	Pro	Asp	Arg	His	Ile	Glu	Ser	Gly	Gly	Arg	Val	Arg	Tyr	
				245					250					255		
Tyr	Gly	His	Ala	Cys	Val	Val	Met	Gln	Thr	Glu	Gln	Ala	Ala	Val	Val	
			260					265						270		
Thr	Asp	Pro	Phe	Ile	Ser	Thr	Asp	Asn	Arg	His	Gly	Asp	Arg	Tyr	Thr	
		275					280					285				
Leu	Asp	Asp	Leu	Pro	Asp	His	Ile	Asp	Leu	Val	Leu	Ile	Thr	His	Gly	
	290					295					300					
His	Gln	Asp	His	Ile	Val	Leu	Glu	Thr	Leu	Leu	Gln	Leu	Arg	Gly	Arg	
305					310					315					320	
Ile	Gly	Thr	Val	Val	Val	Pro	Arg	Thr	Ser	Arg	Gly	Asn	Leu	Pro	Asp	
				325					330					335		
Pro	Ser	Ile	Ala	Leu	Tyr	Leu	Arg	Arg	Ile	Gly	Phe	Thr	Val	Val	Glu	
			340					345					350			

Val Glu Glu Phe Asp Glu Val Pro Phe Pro Gly Gly Thr Val Thr Ala
 355 360 365
 Thr Pro Phe Leu Gly Glu His Ala Asp Leu Asp Ile Arg Gly Lys Ser
 370 375 380
 Thr Tyr Phe Val Arg Met Ala Gly Arg Thr Ile Phe Ile Gly Ala Asp
 385 390 395 400
 Ser Ser Gly Ile Asp Pro Val Leu Tyr Arg Tyr Ile Arg Asp His Val
 405 410 415
 Gly Gln Val Asp Met Ala Phe Leu Gly Met Glu Cys Asp Gly Ala Pro
 420 425 430
 Leu Asn Trp Leu Tyr Lys Gly Leu Leu Thr Lys Pro Val Asn Lys Lys
 435 440 445
 Met Ser Ala Ser Arg Arg Leu Ser Gly Ser Asn Ala Glu Gln Ala Gly
 450 455 460
 Ala Ile Met Thr Glu Leu Gly Ala Thr Ala Gly Tyr Ile Tyr Ala Met
 465 470 475 480
 Gly Glu Glu Ser Trp Gln Gly His Val Met Ala Thr Thr Tyr Asn Glu
 485 490 495
 Asp Thr Tyr Gln Leu Lys Gln Ile Asp Glu Phe Leu Ala Trp Cys Ala
 500 505 510
 Asp Arg Gly Phe Thr Ala Glu His Leu Phe Asn Lys Arg Glu Trp Arg
 515 520 525

Trp

<210> 12
 <211> 90
 <212> PRT
 <213> Actinoplanes sp.

<400> 12

Met Ser Glu Thr Asp Leu Ser Ala Ala Arg His Thr Pro Glu Gln Ile
 1 5 10 15
 Arg Ser Trp Leu Ile Asp Arg Ile Ala Tyr Tyr Val Met Leu Pro Thr
 20 25 30
 Gln Glu Ile Glu Pro Asp Val Ser Leu Ala Glu Tyr Gly Leu Asp Ser
 35 40 45
 Val Tyr Ala Phe Ala Leu Cys Gly Glu Ile Glu Asp Thr Leu Gly Ile
 50 55 60
 Pro Ile Glu Pro Thr Leu Leu Trp Asp Val Asp Thr Val Ala Thr Leu
 65 70 75 80
 Thr Ala His Leu Ala Asp Arg Val Asn Arg
 85 90

<210> 13
 <211> 1051
 <212> PRT
 <213> Actinoplanes sp.

 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 13

Val	Pro	Thr	Pro	Asp	Leu	Arg	Pro	Leu	Thr	Pro	Ala	Gln	Leu	Ala	Val	1	5	10	15
Trp	His	Ala	Gln	Gln	Leu	Ala	Pro	His	Ser	Pro	Val	Tyr	Gln	Val	Gly	20	25	30	
Glu	Phe	Val	Glu	Ile	Asp	Gly	Glu	Cys	Asp	Pro	Asp	Leu	Leu	Val	Ala	35	40	45	
Ala	Leu	Arg	Gln	Val	Met	Gly	Glu	Ala	Glu	Ser	Ala	Arg	Leu	Arg	Phe	50	55	60	
Arg	Val	Ile	Asp	Gly	Thr	Pro	Trp	Gln	Tyr	Val	Ala	Glu	Asp	Gly	Asp	65	70	75	80
Asp	Pro	Ile	Gln	Val	Val	Asp	Leu	Gly	Ala	Ala	Ala	Asp	Pro	Arg	Ala	85	90	95	
Ala	Ala	Leu	Gly	Arg	Met	Ala	Ala	Asp	Leu	Asp	Arg	Pro	Gly	Asp	Leu	100	105	110	
Arg	Asp	Gly	Pro	Leu	Val	Glu	His	His	Val	Tyr	Leu	Leu	Gly	Glu	Gly	115	120	125	
Arg	Val	Ile	Trp	Tyr	His	Arg	Ala	His	His	Ile	Val	Cys	Asp	Gly	Gly	130	135	140	
Ser	Leu	Gly	Ile	Val	Ala	Ser	Arg	Val	Ala	Gly	Val	Tyr	Ser	Ala	Leu	145	150	155	160
Ala	Ala	Gly	Gly	Asp	Val	Arg	Pro	Gly	Ala	Leu	Pro	Pro	Leu	Ser	Val	165	170	175	
Leu	Leu	Ser	Ala	Ala	Asp	Ala	Tyr	Glu	Arg	Ser	Gly	Asp	Arg	Asp	Arg	180	185	190	
Asp	Arg	Glu	His	Trp	Arg	Ser	Ala	Leu	Ala	Gly	Leu	Pro	Ala	Glu	Leu	195	200	205	
Leu	Ala	Gly	Ala	Gly	Arg	Pro	Arg	Pro	Leu	Pro	Gly	Pro	Pro	Val	Arg	210	215	220	
His	Glu	His	Asp	Leu	Ser	Ala	Ala	Glu	Ala	Gly	Arg	Leu	Arg	Ala	Gly	225	230	235	240
Ala	Arg	Arg	Leu	Arg	Thr	Ser	Val	Ala	Gln	Ala	Gly	Ile	Ala	Ala	Ala				

245										250										255									
Ala	Leu	Tyr	Gln	His	Arg	Leu	Thr	Gly	Ala	Arg	Asp	Val	Leu	Val	Ala														
260										265										270									
Val	Pro	Val	Ala	Gly	Arg	Thr	Thr	Arg	Pro	Glu	Phe	Asp	Val	Pro	Gly														
275										280										285									
Met	Thr	Ser	Asn	Val	Val	Pro	Val	Arg	Leu	Ala	Val	Thr	Pro	Ala	Thr														
290										295										300									
Thr	Val	Gly	Glu	Leu	Leu	Arg	Asp	Val	Ala	Arg	Gly	Val	Arg	Asp	Gly														
305										310										315									
Leu	Arg	His	Gln	Arg	Tyr	Pro	Tyr	Pro	Asn	Ile	Val	Asp	Asp	Leu	Gly														
325										330										335									
Leu	Ala	Asp	Arg	Ala	Ala	Leu	Arg	Pro	Val	Thr	Val	Asn	Ala	Leu	Ala														
340										345										350									
Leu	Gly	Arg	Pro	Leu	Arg	Phe	Gly	Ser	Ala	Val	Gly	Val	Arg	Ser	Gly														
355										360										365									
Leu	Ser	Ala	Gly	Pro	Val	Asp	Asp	Val	Thr	Ile	Gly	Leu	Tyr	Glu	Lys														
370										375										380									
Val	Ser	Gly	Gly	Gly	Met	Gln	Thr	Ile	Ala	Glu	Leu	Asn	Pro	Gly	Arg														
385										390										395									
Thr	Asp	Arg	Pro	Asp	Ala	Ala	Glu	Val	Ser	Arg	Trp	Phe	Arg	Thr	Leu														
405										410										415									
Leu	Arg	Gly	Leu	Ala	Glu	Ser	Asp	Ala	Gly	Asp	Pro	Val	Ala	Arg	Ile														
420										425										430									
Asp	Ile	Val	Asp	Glu	Pro	Glu	Arg	Arg	Arg	Leu	Leu	Asp	Glu	Trp	Asn														
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Ala	Thr	Ala	Ala	Pro	Ser	Ser	Asp	Thr	Val	Leu	Ala	Arg	Phe	Glu	Glu														
450										455										460									
Gln	Ala	Ala	Arg	Thr	Pro	Glu	Ala	Pro	Ala	Val	Val	Cys	Gly	Asp	Val														
465										470										475									
Thr	Val	Thr	Tyr	Ala	Glu	Leu	Glu	Ala	Gly	Ala	Asn	Arg	Leu	Ala	Arg														
485										490										495									
Val	Leu	Arg	Ala	Arg	Gly	Ala	Gly	Pro	Glu	Ser	Val	Val	Ala	Leu	Cys														
500										505										510									
Leu	Pro	Arg	Gly	Pro	Glu	Val	Val	Thr	Gly	Ile	Leu	Ala	Ala	Trp	Lys														
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Ala	Gly	Ala	Ala	Tyr	Leu	Pro	Val	Asp	Thr	Glu	Leu	Pro	Ala	Glu	Arg														
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Val	Ala	Tyr	Leu	Leu	Gly	Asp	Ser	Ala	Ala	Ala	Val	Arg	Leu	Gly	Thr														
545										550										555									
Ala	Glu	Thr	Leu	Ala	Ala	Leu	Pro	Asp	Gly	Pro	Ala	Ala	Asp	Val	Asp														
565										570										575									

Val His Ala Pro Glu Ile Ala Arg Glu Ser Pro Ser Pro Leu Arg Leu
 580 585 590
 Glu Pro Leu Pro Asp Gln Leu Ala Tyr Val Ile Tyr Thr Ser Gly Ser
 595 600 605
 Thr Gly Leu Ser Lys Gly Val Gly Val Ser His Gly Gly Leu Ala Asn
 610 615 620
 Tyr Val Gly Trp Ala Ser Val Leu Tyr Gly Gly Leu Ser Ala Pro Leu
 625 630 635 640
 His Ser Ser Leu Ala Phe Asp Leu Thr Val Thr Ser Val Phe Val Pro
 645 650 655
 Leu Val Cys Gly Gly Ser Val Val Val Ser Ala Ala Gly Gly Gly Arg
 660 665 670
 Gly Leu Ala Ser Leu Leu Ala Ala Gly Asp Gly Phe Ser Leu Val Lys
 675 680 685
 Val Val Pro Gly His Leu Arg Leu Leu Ala Glu Leu Val Pro Ala Gly
 690 695 700
 Glu Met Ala Ala Val Gly Ser Leu Val Ala Gly Gly Glu Val Leu Ala
 705 710 715 720
 Gly Gly Asp Val Arg Glu Trp Leu Ser Arg Val Pro Gly Ser Val Val
 725 730 735
 Val Asn Glu Tyr Gly Pro Thr Glu Thr Val Val Gly Cys Ser Val Phe
 740 745 750
 Ser Val Ala Ala Gly Asp Val Val Gly Asp Val Val Pro Val Gly Arg
 755 760 765
 Pro Val Ala Asn Thr Arg Leu Phe Val Leu Asp Glu Gly Leu Arg Pro
 770 775 780
 Val Pro Ala Gly Val Ala Gly Glu Leu Tyr Val Ala Gly Ser Gln Val
 785 790 795 800
 Ala Arg Gly Tyr Val Gly Arg Ser Gly Leu Thr Ala Ser Arg Phe Val
 805 810 815
 Ala Cys Pro Phe Gly Val Gly Glu Arg Met Tyr Arg Thr Gly Asp Val
 820 825 830
 Val Arg Leu Ala Gly Gly Asp Leu Val Phe Val Gly Arg Val Asp Glu
 835 840 845
 Gln Val Lys Ile Arg Gly Tyr Arg Val Glu Pro Asp Glu Val Arg Leu
 850 855 860
 Val Val Ala Gly His Pro Arg Val Ala Gly Ala Ala Val Val Ala Arg
 865 870 875 880
 Pro Asp Ala Val Gly Glu Arg Gln Leu Val Ala Tyr Val Val Ala Ala
 885 890 895

Gly Glu Pro Ala Gly Leu Ala Glu Ser Val Arg Ala His Val Ala Glu
 900 905 910
 Arg Leu Pro Glu Tyr Met Val Pro Ala Ala Val Val Thr Leu Asp Glu
 915 920 925
 Ile Pro Leu Thr Val Asn Gly Lys Val Asp Arg Ala Ala Leu Pro Glu
 930 935 940
 Pro Gly Pro Val Ala Thr Gly Asn Ala Asp Arg Glu Pro Thr Thr Glu
 945 950 955 960
 Arg Glu Ser Leu Leu Cys Gly Ala Phe Ala Asp Val Leu Gly Ile Glu
 965 970 975
 Arg Val Gly Val Asp Asp Asp Phe Phe Ser Leu Gly Gly His Ser Leu
 980 985 990
 Leu Ala Thr Ser Leu Val Ser Arg Val Arg Leu Val Leu Gly Glu Glu
 995 1000 1005
 Leu Pro Ile Glu Glu Leu Phe Ala Thr Pro Thr Pro Ala Glu Leu
 1010 1015 1020
 Ala Ala Trp Leu Gln Arg Asn Ala Asp Arg Pro Gln Pro Ala Arg
 1025 1030 1035
 Pro Ala Leu Arg Pro Met His Glu Arg Glu Thr Thr Ala
 1040 1045 1050
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 Val Glu Gly Pro Asp Ala Thr Tyr Asn Ser Pro Ala Val Leu Arg Leu
 20 25 30
 Thr Gly Glu Leu Asp Thr Ala Ala Leu Glu His Ala Leu Arg Asp Val
 35 40 45
 Leu Glu Arg His Glu Val Leu Arg Thr Val Tyr Pro Asp Val Gly Gly
 50 55 60
 Glu Pro Arg Gln Arg Val Val Arg Pro Asp Asp Met Val Trp Glu Leu
 65 70 75 80
 Pro Thr Thr Arg Val Ser Gly Ala Gly Ala Gly Asp Asp Arg Leu Val
 85 90 95
 Thr Leu Asp Glu Leu Pro Trp Asp Arg Pro Val Leu Asp Leu Pro Ser
 100 105 110
 Pro Ala Pro Ala Gly Arg Glu Pro Asp Gly Glu Ile Thr Val Asp Glu
 115 120 125

Leu Pro Gly Ala Ile Ala Arg Val Ala Ala His Pro Phe Asp Leu Ser
 130 135 140
 Ile Glu Ile Pro Val Arg Ala Arg Leu Phe Ala Leu Gly Pro Arg His
 145 150 155 160
 His Val Leu Val Val Val Leu His His Ile Ala Thr Asp Gly Ser Ser
 165 170 175
 Gly Gly Pro Phe Ala Arg Asp Leu Ala Ala Ala Tyr Arg Ala Arg Arg
 180 185 190
 Thr Gly Thr Ala Pro Gln Trp Ala Pro Leu Pro Val Gln Tyr Ala Asp
 195 200 205
 Tyr Ala Ala Trp Gln Gln Glu Leu Leu Gly Ala Glu Asp Asp Pro Asp
 210 215 220
 Ser Val Ile Ser Arg Gln Leu Ala His Trp Gln Glu Arg Leu Ala Gly
 225 230 235 240
 Met Pro Val Glu Leu Asp Leu Pro Ala Asp Arg Pro Arg Pro Ala Glu
 245 250 255
 Pro Gly His Gly Gly His Thr Lys Ala Leu Ser Leu Pro Pro Ala Val
 260 265 270
 His Arg Gly Leu Ala Thr Leu Ala Arg Arg Arg Arg Ala Thr Leu Gln
 275 280 285
 Met Val Val Gln Thr Gly Val Ala Ile Leu Leu Ser Lys Leu Gly Ala
 290 295 300
 Gly Arg Asp Val Pro Leu Gly Ile Pro Val Ala Gly Arg Thr Asp Ala
 305 310 315 320
 Ala Leu Asp Asp Leu Ile Gly Phe Phe Val Asn Thr Leu Val Val Arg
 325 330 335
 Ala Asp Leu Ser Gly Asp Pro Thr Val Ala Asp Ala Leu Gly Arg Val
 340 345 350
 Arg Gly Gly Ala Val Ala Ala Leu Ala Asp Gln Asp Val Pro Phe Asp
 355 360 365
 Lys Leu Val Glu Arg Leu Ala Pro Ala Arg Val Leu Gly Arg His Pro
 370 375 380
 Leu Phe Gln Val Met Val Ala Pro Leu Asp Asp Gly Thr Pro Ile Asp
 385 390 395 400
 Leu Asp Gly Val Arg Gly Glu Pro Leu Thr Ile Gly Arg Ser Gly Ala
 405 410 415
 Lys Phe Asp Val Glu Val Met Thr Gly Glu Val Arg Ala Ala Asp Gly
 420 425 430
 Ala Pro Ala Gly Ile Arg Gly Ile Leu Thr Leu Ser Ala Asp Leu Phe
 435 440 445
 Asp Glu Ala Thr Ala Gly Arg Met Ala Ala Gly Leu Val Arg Val Leu

450	455	460
Thr Ala Met Ala Glu Ala Pro Glu Arg Arg Leu Ser Gly Ile Glu Val 465 470 475 480		
Leu Ser Pro Gly Glu Arg Ser Arg Leu Leu Val Glu Trp Asn Asp Thr 485 490 495		
Ala Arg Pro Val Val Glu Ser Ser Val Pro Ala Leu Phe Ala Lys Arg 500 505 510		
Val Ala Ala Thr Pro Asp Ala Thr Ala Val Val Gly Glu Gly Val Ser 515 520 525		
Trp Ser Tyr Arg Glu Leu Asp Arg Arg Ser Asp Val Leu Ala Arg Arg 530 535 540		
Leu Val Ala Ala Gly Val Gly Val Glu Ser Pro Val Val Val Ala Leu 545 550 555 560		
Glu Arg Ser Pro Glu Val Leu Ser Ala Phe Leu Ala Val Ala Lys Ala 565 570 575		
Gly Gly Val Phe Val Pro Val Asp Leu Ser Trp Pro Gln Ala Arg Val 580 585 590		
Asp Ala Val Val Ala Asp Cys Ala Ala Arg Val Ala Val Ala Asp Arg 595 600 605		
Pro Met Ser Gly Leu Thr Val Val Ser Ala Gly Leu Gly Gly Asp Ser 610 615 620		
Ala Val Val Ser Ala Asp Leu Thr Ala Asp Arg Ala Val Val Leu Pro 625 630 635 640		
Ser Arg Pro Val Pro Gly Ala Ala Val Tyr Arg Met Tyr Thr Ser Gly 645 650 655		
Ser Thr Gly Arg Pro Lys Gly Val Val Thr Thr His Gln Asn Leu Val 660 665 670		
Asp Leu Ala Thr Asp Thr Cys Trp Gly Pro Thr Pro Arg Val Leu Phe 675 680 685		
His Ala Pro His Ala Phe Asp Ala Ser Ser Tyr Glu Ile Trp Val Pro 690 695 700		
Leu Leu Asn Gly Gly Thr Val Val Val Ala Pro Gln Arg Ser Ile Asp 705 710 715 720		
Ala Thr Val Leu Lys Asp Leu Ile Arg Ala His Asp Leu Thr His Val 725 730 735		
His Val Thr Ala Gly Leu Leu Arg Val Leu Asp Pro Ser Cys Phe Ala 740 745 750		
Gly Leu Thr Glu Val Leu Thr Gly Gly Asp Ala Val Ser Ala Glu Ala 755 760 765		
Val Arg Arg Val Lys Asp Ala Asn Pro Gly Leu Arg Val Arg Gln Leu 770 775 780		

Pro Gly	Gly Ala Ala Asn	Ile	Ala Asp Ile Tyr	Pro	Leu Ala Pro
1100		1105		1110	
Leu Gln	Glu Gly Ile Phe	Phe	His His Leu Met	Thr	Glu Gly Asp
1115		1120		1125	
Thr Ala	Asp Val Tyr Ala	Leu	Pro Tyr Leu Leu	Arg	Val Gly Thr
1130		1135		1140	
Arg Glu	Gln Leu Asp Ala	Phe	Leu Gly Ala Leu	Gln	Gln Val Val
1145		1150		1155	
Asp Arg	His Asp Val Tyr	Arg	Thr Ala Ile Ala	Trp	Gln Asn Leu
1160		1165		1170	
Arg Glu	Pro Val Gln Val	Val	His Arg His Ala	Thr	Leu Pro Val
1175		1180		1185	
Thr Glu	Val Thr Pro Asp	Gln	Leu His Ala Ala	Ala	Thr Gly Gly
1190		1195		1200	
Arg Leu	Pro Leu Asp His	Ala	Pro Leu Leu Ser	Val	His Ile Ala
1205		1210		1215	
Pro Glu	Pro Asp Gly Gly	Trp	Leu Ala Leu Leu	Arg	Met His His
1220		1225		1230	
Leu Val	Gln Asp His Thr	Ala	Leu Asp Ile Val	Leu	Asp Glu Ile
1235		1240		1245	
Arg Thr	Ile Leu Ala Gly	Ala	Thr Asp His Leu	Pro	Pro Pro Val
1250		1255		1260	
Pro Phe	Arg Asn Phe Val	Ala	Arg Ser Arg Arg	Gly	Ala Ala Glu
1265		1270		1275	
Ala Ala	His Arg Asp Tyr	Phe	Thr Gly Leu Leu	Gly	Asp Val Thr
1280		1285		1290	
Glu Thr	Thr Ala Pro Tyr	Gly	Leu Thr Asp Val	His	Gly Glu His
1295		1300		1305	
Ser Gly	Val Arg Arg Gly	Arg	Leu Ala Val Ser	Ala	Gly Leu Ala
1310		1315		1320	
Gly Arg	Val Arg Glu Thr	Ala	Arg Asp Arg Gly	Val	Ser Pro Ala
1325		1330		1335	
Thr Leu	Phe His Leu Ala	Trp	Ala Arg Val Leu	Ala	Ala Val Ser
1340		1345		1350	
Gly Arg	Asp Asp Val Val	Phe	Gly Thr Val Leu	Leu	Gly Arg Met
1355		1360		1365	
Asp Ala	Gly Pro Gly Ala	Asp	Arg Val Pro Gly	Leu	Phe Met Asn
1370		1375		1380	
Thr Leu	Pro Val Arg Val	Arg	Leu Gly Gly Arg	Thr	Val Asp Glu
1385		1390		1395	
Ala Leu	His Gly Met Arg	Ala	Gln Leu Ala Asp	Leu	Leu Thr His

Glu His 1415	Ala Pro Leu Val	Leu 1420	Ala Gln Gln Ser	Ala 1425	Gly Leu Pro
Gly Gly 1430	Ser Pro Leu Phe	Thr 1435	Ser Leu Phe Asn	Tyr 1440	Arg His Asn
Ala Thr 1445	Asp Ile Glu Arg	Ser 1450	Gly Thr Gly Ile	Asp 1455	Gly Val Glu
Ala Leu 1460	Pro Thr Gly Asp	Pro 1465	Ser Asn Tyr Pro	Leu 1470	Asp Val Ser
Val Asn 1475	Gln Ser Pro Leu	Gly 1480	Phe Glu Leu Val	Val 1485	Glu Ala Thr
Glu Pro 1490	Ala Asp Pro Asp	Gln 1495	Leu Cys Arg Leu	Leu 1500	His Ala Cys
Leu Asp 1505	Asp Leu Ile Ala	Ala 1510	Leu Asp Glu Gln	Pro 1515	Gly Arg Ala
Leu Gly 1520	Thr Leu Asp Val	Val 1525	Ala Gly Arg Glu	Arg 1530	Asp Leu Leu
Leu Asp 1535	Gly Trp Asn Ala	Thr 1540	Ala Val Pro Ala	Gln 1545	Pro Ala Leu
Val Pro 1550	Glu Leu Phe Thr	Ala 1555	Gln Ala Ala Arg	Thr 1560	Pro Thr Trp
Pro Ala 1565	Leu Val Thr Ala	Gly 1570	Ala Glu Met Ser	Tyr 1575	Ala Glu Leu
Glu Glu 1580	Arg Ser Asn Arg	Leu 1585	Ala Arg Trp Leu	Ala 1590	Gly Arg Gly
Val Gly 1595	Ala Asp Asp Arg	Val 1600	Ala Leu Met Met	Arg 1605	Arg Gly Pro
Glu Leu 1610	Met Val Ala Ile	Leu 1615	Ala Val Leu Lys	Ala 1620	Gly Ala Ala
Tyr Leu 1625	Pro Val Asp Pro	Asp 1630	Leu Pro Arg Asp	Arg 1635	Val Asp Tyr
Leu Leu 1640	Ala Asp Ala Ala	Pro 1645	Ala Phe Val Leu	Ala 1650	Glu Arg Ala
Thr Ala 1655	Pro Trp Val Pro	Val 1660	Ala Gly Gly Ile	Pro 1665	Val Leu Val
Val Asp 1670	Ala Pro Ala Val	Ala 1675	Ala Glu Val Ala	Ala 1680	His Ser Gly
Glu Ala 1685	Val Thr Asp Arg	Asp 1690	Arg Arg Ala Ala	Leu 1695	Arg Gly Gly
His Leu 1700	Ala Tyr Val Ile	Tyr 1705	Thr Ser Gly Ser	Thr 1710	Gly Arg Pro

Lys Gly Val Leu Ile Thr His Asp Gly Leu Ala Asn Leu Thr Leu	1715	1720	1725
Asp His Gly Arg Phe Gly Leu Gly Pro Gly Ala Arg Val Ala Gln	1730	1735	1740
Phe Ala Ser Pro Gly Phe Asp Met Phe Val Asp Glu Trp Ser Met	1745	1750	1755
Ala Leu Leu Ala Gly Ala Ala Leu Thr Phe Val Pro Pro Glu Arg	1760	1765	1770
Arg Leu Gly Ala Asp Leu Ala Ala Phe Leu Ala Glu Tyr Gly Val	1775	1780	1785
Thr His Ala Thr Leu Pro Pro Ala Val Val Gly Thr Pro Asp Gly	1790	1795	1800
Val Leu Pro Pro Ser Phe Val Leu Asp Val Gly Gly Asp Val Leu	1805	1810	1815
Pro Gly Asp Leu Ala Arg Arg Trp Leu Arg Asp Gly Arg Val Leu	1820	1825	1830
Phe Asn Ser Tyr Gly Pro Thr Glu Thr Thr Val Asn Ala Ala Thr	1835	1840	1845
Trp Arg Ala Glu Ala Gly Asp Trp Gly Ser Val Ala Pro Ile Gly	1850	1855	1860
Thr Pro Val Pro Asn Leu Arg Ala Tyr Val Leu Asp Gly Trp Leu	1865	1870	1875
Arg Pro Val Pro Val Gly Ala Asp Gly Glu Leu Tyr Val Ser Gly	1880	1885	1890
Ala Gly Leu Ala Arg Gly Tyr Leu Asn Arg Ala Gly Leu Thr Ala	1895	1900	1905
Glu Arg Phe Val Ala Cys Pro Phe Glu Pro Gly Glu Arg Met Tyr	1910	1915	1920
Arg Thr Gly Asp Val Val Arg Trp Thr Ala Glu Gly Arg Leu Val	1925	1930	1935
Phe Ala Gly Arg Ser Asp Asp Gln Val Lys Ile Arg Gly Phe Arg	1940	1945	1950
Ile Glu Pro Gly Glu Val Glu Ala Val Leu Ala Ala Gly Pro Gly	1955	1960	1965
Val Ser Gln Ala Ala Val Ile Val Arg Glu Asp Val Pro Gly Asp	1970	1975	1980
Lys Arg Leu Val Ala Tyr Val Val Gly Gly Asp Val Glu Ala Leu	1985	1990	1995
Arg Ser Tyr Ala Gln Gln Arg Leu Pro Gly Tyr Met Val Pro Ser	2000	2005	2010

Ala Phe Val Glu Leu Asp Arg Leu Pro Leu Thr Val Asn Gly Lys 2015 2020 2025
Leu Asp Arg Arg Ala Leu Pro Val Pro Asp Leu Ala Arg Gly Thr 2030 2035 2040
Gly Ser Gly Arg Pro Ala Gly Thr Pro Arg Glu Gln Leu Leu Cys 2045 2050 2055
Ala Gly Phe Ala Ala Val Leu Gly Val Asp Asp Val Gly Ala Asp 2060 2065 2070
Asp Asp Phe Phe Ala Leu Gly Gly His Ser Leu Leu Val Val Ser 2075 2080 2085
Leu Val Glu Trp Leu Arg Arg Arg Gly Val Ser Val Pro Val Arg 2090 2095 2100
Ala Leu Phe Thr Thr Pro Thr Pro Ala Gly Leu Ala Glu Ala Val 2105 2110 2115
Gly Asp Gly Ala Val Val Val Pro Pro Asn Leu Ile Pro Glu Gly 2120 2125 2130
Ala Ala Glu Leu Thr Pro Glu Met Val Pro Leu Ala Asp Leu Thr 2135 2140 2145
Ser Glu Glu Leu Ala Ile Val Val Ala Ser Val Pro Gly Gly Ala 2150 2155 2160
Ala Asn Val Ala Asp Val Tyr Pro Leu Ala Pro Leu Gln Glu Gly 2165 2170 2175
Ile Phe Phe Pro Val Ala Thr Gly Pro Gln Cys Tyr Ala Thr Val 2180 2185 2190
Gly Ser Ser Leu Pro Asp Asp Gly Gly Ser Ala Pro Cys Ser Arg 2195 2200 2205
Phe Arg Arg Arg Cys Val Ser Thr Ser Val Val Trp Gln Gly Leu 2210 2215 2220
Arg Glu Pro Val Gln Val Val Trp Arg His Ala Arg Leu Pro Val 2225 2230 2235
Glu Glu Val Val Leu His Glu Gly Ala Asp Pro Val Glu Gln Met 2240 2245 2250
Met Ala Leu Ala Gly Gly Trp Met Asp Leu Thr Arg Ala Pro Leu 2255 2260 2265
Ile Asp Val His Ile Ala Ala Gly Pro Gly Gly Asp Arg Trp Leu 2270 2275 2280
Ala Val Leu Arg Ile His His Leu Val Gln Asp His Thr Ala Leu 2285 2290 2295
Glu Thr Leu Leu Asp Glu Leu Gln Ser Phe Leu Glu Gly Arg Gly 2300 2305 2310
Gly Glu Leu Ala Glu Pro Val Pro Phe Arg Glu Phe Val Ala Gln

2315	2320	2325
Ala Arg Leu Gly Val Pro 2330	Arg Glu Glu His Glu 2335	Arg Tyr Phe Ala 2340
Glu Leu Leu Gly Asp Ile 2345	Thr Glu Thr Thr Ala 2350	Pro Tyr Asp Leu 2355
Thr Asp Val His Gly Asp 2360	Gly Thr Gly Tyr Asp 2365	His Gly Ala Leu 2370
Pro Leu Asp Ala Thr Val 2375	Ala Ala Arg Val Arg 2380	Glu Ala Ala Arg 2385
Thr Leu Gly Val Ser Pro 2390	Ala Thr Leu Phe His 2395	Leu Ala Trp Ala 2400
Arg Val Leu Gly Thr Leu 2405	Ala Gly Arg Asp Asp 2410	Val Val Phe Gly 2415
Thr Val Leu Phe Gly Arg 2420	Met Asn Ser Gly Ala 2425	Gly Ala Asp Arg 2430
Val Ser Gly Leu Phe Ile 2435	Asn Thr Leu Pro Val 2440	Arg Val Arg Leu 2445
Gly Ala Pro Thr Gly Asp 2450	Ala Leu Gly Asp Leu 2455	Arg Asp Gln Leu 2460
Ala Glu Leu Leu Val His 2465	Glu His Ala Ser Leu 2470	Ala Ser Ala Gln 2475
Lys Ala Ser Gly Leu Pro 2480	Gly Gly Ser Pro Leu 2485	Phe Thr Ser Ile 2490
Phe Asn Tyr Arg His Asn 2495	Gln Val Ser Ala Glu 2500	Arg Glu Thr Ala 2505
Ala Leu Pro Gly Ile Arg 2510	Val Leu Ala Ala Arg 2515	Asp Ser Thr Asn 2520
Tyr Pro Leu Thr Val Ala 2525	Val Asp Asp Asp Gly 2530	His Gly Phe Thr 2535
Leu Val Val Glu Val Ala 2540	Ser Thr Val Asp Ala 2545	Ala Gly Val Cys 2550
Glu Leu Leu His Thr Ala 2555	Val Asp Asn Leu Ile 2560	Ala Ala Leu Thr 2565
Asp Arg Pro Gly Gly Pro 2570	Leu Ala Glu Val Asp 2575	Ile Leu Glu Arg 2580
Gly Leu Arg Asp Arg Leu 2585	Leu Thr Ala Trp Asn 2590	Glu Ala Arg Glu 2595
Pro Ala Pro Pro Val Thr 2600	Leu Pro Asp Leu Phe 2605	Asp Arg Gln Ala 2610
Arg Arg Thr Pro Glu Ala 2615	Val Ala Leu Thr Ala 2620	Asp Gly Val Ser 2625

[illegible]

3230	3235	3240
Leu Gln Glu Gly Ile Phe Phe His His Leu Met Ala Asp Ala Gly 3245 3250 3255		
Arg Ala Asp Ala Tyr Ala Met Pro Tyr Val Leu His Leu Asp Thr 3260 3265 3270		
Ala Glu Arg Leu Asp Val Leu Leu Gly Ala Leu Gln Arg Val Ile 3275 3280 3285		
Asp Arg Asn Asp Ile Tyr Arg Thr Gly Val Val Ser Ala Gly Leu 3290 3295 3300		
Arg Glu Pro Val Gln Val Val Trp Arg Ser Ala Val Leu Pro Val 3305 3310 3315		
Glu Glu Val Ala Leu Asp Gly Gly His Asp Pro Val Glu Gln Leu 3320 3325 3330		
Leu Ala Ala Ala Gly Glu Glu Phe Asp Leu Thr Arg Ala Pro Leu 3335 3340 3345		
Ile Arg Ala His Val Ala Ala His Pro Asp Gly Gly Arg Leu Leu 3350 3355 3360		
Leu Leu Arg Ile His His Leu Val Gln Asp His Thr Thr Phe Asp 3365 3370 3375		
Val Val Leu Gly Glu Leu Arg Ala Phe Leu Glu Gly Arg Gly Gly 3380 3385 3390		
Glu Leu Ala Glu Pro Val Pro Phe Arg Glu Phe Val Ala Gln Ala 3395 3400 3405		
Arg Leu Gly Val Pro Arg Glu Glu His Glu Arg Tyr Phe Ala Glu 3410 3415 3420		
Leu Leu Gly Asp Val Thr Glu Thr Thr Ala Pro Tyr Gly Leu Thr 3425 3430 3435		
Asp Val His Gly Asp Gly Ser Arg Ala Val Gln Val Ser Leu Pro 3440 3445 3450		
Val Ala Glu Ala Leu Ala Val Arg Val Arg Glu Val Ala Arg Thr 3455 3460 3465		
Leu Gly Val Ser Pro Ala Thr Val Phe His Leu Ala Trp Ala Arg 3470 3475 3480		
Val Leu Ser Val Ile Ala Gly Arg Asp Asp Val Val Phe Gly Thr 3485 3490 3495		
Ile Leu Phe Gly Arg Met Asn Ser Gly Ala Ala Ala Glu Arg Val 3500 3505 3510		
Pro Gly Leu Phe Ile Asn Thr Leu Pro Val Arg Val Arg Leu Asn 3515 3520 3525		
Gly Thr Ser Val Gly Glu Ala Leu Thr Ala Leu Arg Asp Gln Met 3530 3535 3540		

Ala	Glu	Leu	Met	Ala	His	Glu	His	Ala	Pro	Leu	Ala	Leu	Ala	Gln
3545						3550					3555			
Arg	Ala	Gly	Gly	Val	Pro	Ala	Gly	Ser	Pro	Leu	Phe	Thr	Ser	Leu
3560						3565					3570			
Phe	Asn	Tyr	Arg	His	Asn	Val	Ala	Gly	Gly	Gly	Asp	Gly	Gly	Ala
3575						3580					3585			
Leu	Glu	Gly	Val	Thr	Pro	Val	Leu	His	Arg	Asp	Thr	Thr	Asn	Tyr
3590						3595					3600			
Pro	Val	Val	Val	Ser	Val	Asp	Asp	Asp	Gly	Thr	Ser	Phe	Asp	Leu
3605						3610					3615			
Val	Val	Glu	Ala	Val	Ala	Pro	Ala	Glu	Ala	Gly	Arg	Val	Gly	Arg
3620						3625					3630			
Leu	Met	His	Glu	Cys	Leu	Ala	Glu	Leu	Val	Gly	Ala	Leu	Ala	Gly
3635						3640					3645			
Ala	Pro	Glu	Thr	Pro	Leu	Ser	Arg	Val	Arg	Val	Ile	Asp	Glu	Ala
3650						3655					3660			
Glu	Ile	Glu	Arg	Val	Val	His	Ser	Trp	Asn	Asp	Thr	Ala	Arg	Pro
3665						3670					3675			
Val	Val	Glu	Ser	Ser	Val	Pro	Ala	Leu	Phe	Ala	Glu	Gln	Val	Ala
3680						3685					3690			
Ala	Ala	Pro	Asp	Ala	Thr	Ala	Val	Val	Gly	Glu	Gly	Val	Ser	Trp
3695						3700					3705			
Ser	Tyr	Arg	Glu	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala	Arg	Ser
3710						3715					3720			
Leu	Val	Ala	Ala	Gly	Val	Gly	Val	Glu	Ser	Pro	Val	Val	Val	Ala
3725						3730					3735			
Leu	Glu	Arg	Ser	Pro	Glu	Val	Leu	Ser	Ala	Phe	Leu	Ala	Val	Ala
3740						3745					3750			
Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp	Pro	Gln
3755						3760					3765			
Ala	Arg	Ile	Asp	Ala	Val	Val	Ala	Asp	Cys	Ala	Ala	Arg	Val	Ala
3770						3775					3780			
Val	Ala	Asp	Arg	Pro	Met	Ser	Gly	Leu	Thr	Val	Val	Pro	Ala	Asp
3785						3790					3795			
Gln	Val	Gly	Asp	Ser	Ala	Val	Val	Leu	Pro	Ala	Gly	Pro	Val	Pro
3800						3805					3810			
Gly	Ala	Ala	Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg
3815						3820					3825			
Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp	Leu	Ala
3830						3835					3840			

Thr Asp	Thr Cys Trp Gly	Pro	Thr Pro Arg Val	Leu	Phe His Ala
3845		3850		3855	
Pro His	Ala Phe Asp Ala	Ser	Ser Tyr Glu Ile	Trp	Val Pro Leu
3860		3865		3870	
Leu Asn	Gly Gly Thr Val	Val	Val Ala Pro Gln	Arg	Ser Ile Asp
3875		3880		3885	
Ala Thr	Val Leu Arg Asp	Leu	Ile Arg Gly His	Glu	Leu Thr His
3890		3895		3900	
Val His	Val Thr Ala Gly	Leu	Leu Arg Val Leu	Asp	Pro Ser Cys
3905		3910		3915	
Phe Ala	Gly Leu Thr Glu	Val	Leu Thr Gly Gly	Asp	Ala Val Ser
3920		3925		3930	
Ala Glu	Ala Val Arg Arg	Val	Arg Glu Ala Asn	Pro	Gly Leu Arg
3935		3940		3945	
Val Arg	Gln Leu Tyr Gly	Pro	Thr Glu Val Thr	Leu	Cys Ala Thr
3950		3955		3960	
Gln His	Leu Leu Val Asp	Gly	Val Pro Ile Gly	Arg	Pro Leu Asp
3965		3970		3975	
Asn Thr	Arg Val Tyr Val	Leu	Asp Asp Leu Leu	Gln	Pro Val Pro
3980		3985		3990	
Val Gly	Val Thr Gly Glu	Leu	Tyr Val Ala Gly	Ala	Gly Leu Ala
3995		4000		4005	
Arg Gly	Tyr Ala Gly Met	Pro	Gly Leu Thr Ala	Glu	Arg Phe Val
4010		4015		4020	
Ala Asp	Pro Phe Ser Val	Gly	Gly Arg Leu Tyr	Arg	Thr Gly Asp
4025		4030		4035	
Leu Val	Arg Trp Thr Asp	Asp	Gly Val Leu His	Phe	Ala Gly Arg
4040		4045		4050	
Ala Asp	Asp Gln Val Lys	Ile	Arg Gly Tyr Arg	Val	Glu Pro Gly
4055		4060		4065	
Glu Val	Glu Ala Val Leu	Ala	Gln His Pro Asp	Val	Ser Gln Val
4070		4075		4080	
Ala Val	Val Val Arg Glu	Asp	Thr Pro Gly Asp	Lys	Arg Leu Val
4085		4090		4095	
Ala Tyr	Val Val Gly Gly	Asp	Val Glu Ala Tyr	Ala	Gln Glu Arg
4100		4105		4110	
Leu Pro	Gly Tyr Leu Val	Pro	Ser Ala Phe Val	His	Leu Asp Ala
4115		4120		4125	
Leu Pro	Leu Thr Ser Asn	Gln	Lys Val Asp Arg	Ala	Ala Leu Pro
4130		4135		4140	
Ala Pro	Ser Val Glu Ser	Gly	Val Gly Arg Ala	Pro	Ala Asp Ala

4145	4150	4155
Arg Glu Glu Leu Met Cys Ala 4160	Ala Phe Ala Glu Val 4165	Leu Asp Leu 4170
Asp Arg Val Gly Val Asp Asp 4175	Asp Phe Phe Ala Leu 4180	Gly Gly His 4185
Ser Leu Leu Val Val Arg Leu 4190	Val Gly Arg Ile Arg 4195	Gln Val Phe 4200
Gly Val Glu Val Ser Ala Arg 4205	Leu Val Phe Asp Ala 4210	Arg Thr Pro 4215
Ala Gly Val Val Ala Arg Leu 4220	Ser Glu Gly Gly Thr 4225	Ala Arg Glu 4230
Ala Val Arg Ala Arg Val Arg 4235	Pro Ala Arg Val Pro 4240	Leu Ser Phe 4245
Ala Gln Arg Arg Leu Trp Phe 4250	Leu Ser Gln Leu Glu 4255	Gly Pro Ser 4260
Ala Thr Tyr Asn Ile Pro Val 4265	Ala Leu Arg Leu Asp 4270	Gly Pro Leu 4275
Asp Arg Asp Ala Leu Thr Ala 4280	Ala Leu His Asp Val 4285	Val Ala Arg 4290
His Glu Val Leu Arg Thr Val 4295	Phe Thr Val Ala Asp 4300	Gly Glu Pro 4305
Trp Gln Gln Ile Leu Asp Asp 4310	Pro Gln Val Ser Val 4315	Pro Val Val 4320
Glu Val Thr Pro Asp Arg Leu 4325	Pro Glu Ala Val Ala 4330	Val Ala Ala 4335
Gly His Arg Phe Asp Leu Gly 4340	Arg Glu Leu Pro Leu 4345	Arg Ala Val 4350
Leu Leu Ala Thr Gly Asp Asp 4355	Val His Val Leu Val 4360	Leu Val Val 4365
His His Ile Ala Ala Asp Gly 4370	Trp Ser Met Arg Pro 4375	Leu Ala Arg 4380
Asp Leu Ala Ala Ala Tyr Ala 4385	Ala Arg Ile Asp Ala 4390	Thr Ala Pro 4395
Ala Leu Gly Ala Leu Pro Val 4400	Gln Tyr Ala Asp Tyr 4405	Ala Leu Trp 4410
Gln Arg Asp Val Leu Gly Ser 4415	Glu His Asp Pro Asp 4420	Ser Val Ile 4425
Ser Gln Gln Val Ala Tyr Trp 4430	Arg Arg Gln Leu Ala 4435	Gly Val Pro 4440
Glu Glu Leu Asp Leu Pro Val 4445	Asp Arg Ala Arg Pro 4450	Ala Glu Ala 4455

Ser	His	Arg	Gly	His	Thr	Val	Glu	Phe	Ala	Val	Pro	Pro	Ala	Val
4460						4465					4470			
His	His	Gln	Leu	Ala	Glu	Leu	Ala	Arg	Arg	Asn	Gly	Val	Thr	Val
4475						4480					4485			
Phe	Met	Thr	Val	Gln	Thr	Ala	Leu	Ala	Val	Leu	Leu	Ser	Lys	Leu
4490						4495					4500			
Gly	Ala	Gly	Thr	Asp	Ile	Pro	Ile	Gly	Val	Ala	Val	Ala	Gly	Arg
4505						4510					4515			
Thr	Asp	Pro	Thr	Leu	Asp	Asn	Leu	Ile	Gly	Phe	Phe	Val	Asn	Thr
4520						4525					4530			
Leu	Val	Leu	Arg	Thr	Asp	Leu	Thr	Gly	Asn	Pro	Thr	Ile	Thr	Asp
4535						4540					4545			
Leu	Leu	His	Arg	Thr	Arg	Asp	Thr	Thr	Leu	His	Ala	Phe	Thr	His
4550						4555					4560			
Gln	Asp	Val	Pro	Phe	Glu	Lys	Leu	Val	Glu	Asp	Leu	Ala	Pro	Thr
4565						4570					4575			
Arg	Ser	Leu	Ala	Arg	His	Pro	Leu	Phe	Gln	Val	Met	Met	Thr	Leu
4580						4585					4590			
Gln	Ser	Ala	Ser	Ala	Asp	Glu	Glu	Pro	Leu	Ala	Leu	Ala	Gly	Leu
4595						4600					4605			
Arg	Val	Thr	Asp	Leu	Pro	Ala	Gly	Glu	Thr	Pro	Ala	Lys	Val	Asp
4610						4615					4620			
Leu	Asp	Leu	Thr	Leu	His	Glu	Val	Ala	Gly	Arg	Asp	Gly	Met	His
4625						4630					4635			
Ala	Thr	Leu	Leu	Gly	Ala	Ala	Asp	Leu	Phe	Glu	Gln	Glu	Thr	Val
4640						4645					4650			
Arg	Ala	Leu	Ala	Asp	Arg	Leu	Leu	Arg	Thr	Leu	Glu	Ala	Met	Ala
4655						4660					4665			
Ala	Ala	Pro	Asp	Asp	Arg	Leu	Asp	Arg	Ile	Glu	Val	Leu	Ser	Pro
4670						4675					4680			
Gly	Glu	Arg	Ser	Arg	Leu	Leu	Val	Glu	Trp	Asn	Asp	Thr	Ala	Arg
4685						4690					4695			
Pro	Val	Val	Glu	Ser	Ser	Val	Pro	Ala	Leu	Phe	Ala	Glu	Gln	Val
4700						4705					4710			
Ala	Ala	Ala	Pro	Asp	Ala	Val	Ala	Val	Val	Gly	Glu	Gly	Val	Ser
4715						4720					4725			
Trp	Thr	Tyr	Arg	Glu	Leu	Asp	Ala	Arg	Ser	Asp	Ala	Leu	Ala	Arg
4730						4735					4740			
Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Val	Glu	Ser	Pro	Val	Val	Val
4745						4750					4755			

Ala	Leu	Glu	Arg	Ser	Pro	Glu	Val	Leu	Ser	Ala	Phe	Leu	Ala	Val
4760						4765					4770			
Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp	Pro
4775						4780					4785			
Gln	Ala	Arg	Val	Asp	Ala	Val	Val	Ala	Asp	Cys	Gly	Ala	Arg	Ile
4790						4795					4800			
Ala	Val	Ala	Asp	Arg	Pro	Met	Ser	Gly	Leu	Thr	Val	Val	Ser	Ala
4805						4810					4815			
Gly	Leu	Gly	Gly	Asp	Ser	Ala	Val	Val	Ser	Gly	Asp	Leu	Thr	Ala
4820						4825					4830			
Asp	Arg	Ala	Val	Val	Leu	Pro	Ala	Gly	Pro	Val	Pro	Gly	Ala	Ala
4835						4840					4845			
Val	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Arg	Pro	Lys	Gly
4850						4855					4860			
Val	Val	Thr	Thr	His	Gln	Asn	Leu	Val	Asp	Leu	Ala	Thr	Asp	Thr
4865						4870					4875			
Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe	His	Ala	Pro	His	Ala
4880						4885					4890			
Phe	Asp	Ala	Ser	Ser	Tyr	Glu	Ile	Trp	Val	Pro	Leu	Leu	Asn	Gly
4895						4900					4905			
Gly	Thr	Val	Val	Val	Ala	Pro	Arg	Arg	Ser	Ile	Asp	Ala	Thr	Val
4910						4915					4920			
Leu	Arg	Asp	Leu	Ile	Gly	Ala	His	Glu	Leu	Thr	His	Val	His	Val
4925						4930					4935			
Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Asp	Pro	Ser	Cys	Phe	Ala	Gly
4940						4945					4950			
Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly	Asp	Ala	Val	Ser	Ala	Glu	Ala
4955						4960					4965			
Val	Arg	Arg	Val	Lys	Asp	Ala	Asn	Pro	Gly	Leu	Arg	Val	Arg	Gln
4970						4975					4980			
Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr	Leu	Cys	Ala	Thr	Gln	His	Leu
4985						4990					4995			

Leu

<210> 15
 <211> 4999
 <212> PRT
 <213> Actinoplanes sp.

<400> 15

Met	Ile	Pro	Leu	Ser	Phe	Ala	Gln	Arg	Arg	Leu	Trp	Phe	Leu	Gly	Arg
1				5				10					15		

Leu Glu Gly Pro Ser Ala Thr Tyr Asn Ile Pro Leu Val Leu Gly Leu
 20 25 30
 Thr Gly Thr Val Asp Ala Ala Ala Leu Glu Thr Ala Leu Arg Asp Val
 35 40 45
 Leu Glu Arg His Glu Val Leu Arg Thr Val Tyr Pro Asp Ala Gly Gly
 50 55 60
 Glu Pro His Gln Arg Ile Leu Pro Leu Gly Glu Thr Gly Phe Gly Leu
 65 70 75 80
 Arg Val Ala Glu Val Thr Asp Gly Glu Leu Asp Ala Ala Val Ala Asp
 85 90 95
 Ala Thr Gly His Ala Phe Asp Leu Ala Thr Glu Ile Pro Val Arg Ala
 100 105 110
 Ser Leu Leu Thr Val Glu Pro Gly Arg His Val Leu Ala Leu Val Leu
 115 120 125
 His His Ile Ala Ala Asp Gly Trp Ser Met Gly Pro Leu Leu Arg Asp
 130 135 140
 Leu Ser Thr Ala Tyr Thr Ala Arg Leu Ala Gly Gly Glu Pro Ala Trp
 145 150 155 160
 Ser Pro Leu Pro Val Gln Tyr Ala Asp Tyr Ala Leu Trp Gln Gln Glu
 165 170 175
 Val Leu Gly Ala Gly Asp Asp Pro Glu Ser Leu Leu Arg Glu Gln Val
 180 185 190
 Gly Tyr Trp Arg Ser Ala Leu Ala Gly Ala Pro Glu Glu Leu Arg Leu
 195 200 205
 Pro Ala Asp His Arg Arg Pro Pro Val Ser Ser Ser Arg Ala His Met
 210 215 220
 Ala Glu Phe Ala Val Pro Ala Ala Ala His Gly Asp Leu Thr Ala Leu
 225 230 235 240
 Thr Arg Glu Leu Gly Ala Thr Leu Phe Met Ala Val His Ala Ala Thr
 245 250 255
 Ala Met Val Leu Ser Gly Leu Gly Ala Gly Asp Asp Leu Pro Ile Gly
 260 265 270
 Thr Val Val Ala Gly Arg Thr Asp Ala Gly Leu Asp Asp Leu Val Gly
 275 280 285
 Cys Phe Val Asn Asn Leu Val Ile Arg Ala Asp Leu Thr Gly Asp Pro
 290 295 300
 Thr Phe Ala Asp Leu Leu Arg Gln Val Arg Glu Arg Ala Leu Asp Ala
 305 310 315 320
 Tyr Gly His Gln Asp Val Pro Phe Glu Lys Leu Val Glu Glu Leu Ala
 325 330 335
 Pro Ser Arg Ser Leu Ser Arg His Pro Leu Phe Gln Val Ala Val Ala

340	345	350
Val Glu Thr Asp Asp Leu Ile Gly Gly Arg Gly Gly Gly Pro Ala Leu 355 360 365		
Arg Leu Pro Gly Leu Gly Ile Glu Val Leu Pro Gly Glu Pro Ser Ala 370 375 380		
Arg Asp Leu Asp Leu Asp Leu Val Val Arg Glu Thr Phe Asp Ala Glu 385 390 395 400		
Gly Arg Pro Ala Gly Leu Thr Gly Ala Leu Ile Gly Ala Ala Gly Leu 405 410 415		
Phe Asp Ala Ala Ser Val Glu Arg Leu Ala Ala Leu Leu Ala Arg Ala 420 425 430		
Leu Glu Ala Leu Ala Ala Asp Pro Arg Thr Arg Ala Gly Asp Leu Asp 435 440 445		
Leu Leu Ser Pro Ala Asp Arg Arg Leu Ile Leu Arg Gly Trp Asn Asp 450 455 460		
Thr Ala Ala Pro Ala Pro Ala Gly Leu Val Pro Asp Leu Phe Ala Ala 465 470 475 480		
Gln Ala Ala Arg Thr Pro Asp Ala Val Ala Val Ala Gly Pro Asp Arg 485 490 495		
Glu Leu Thr Tyr Ala Glu Leu Asp Glu Arg Ser Gly Arg Leu Ala Arg 500 505 510		
Trp Leu Ile Arg Arg Gly Val Ala Ala Asp Thr Arg Val Ala Leu Val 515 520 525		
Leu Glu Arg Ser Ala Glu Leu Pro Val Ala Ile Leu Ala Val Leu Lys 530 535 540		
Ala Gly Gly Ala Tyr Leu Pro Ile Asp Pro Ala Gln Pro Pro Arg Arg 545 550 555 560		
Ile Ala Asp Ile Val Ala Asp Ala Ala Pro Ala Leu Val Leu Ala Gln 565 570 575		
Ala Ser Thr Ala Asp Val Val Ala Asp Ala Ser Pro Ala Leu Val Leu 580 585 590		
Ala Pro Ala Ser Asp Gly Val Pro Thr Gly Ala Val Pro Val His Leu 595 600 605		
Leu Asp Ser Pro Ala Val Arg Asp Glu Val Ala Gln Cys Pro Ala Gly 610 615 620		
Ala Val Thr Asp Ala Asp Arg Arg Gly Val Leu Leu Gly Gly His Ala 625 630 635 640		
Ala Tyr Val Ile Tyr Thr Ser Gly Ser Thr Gly Arg Pro Lys Gly Val 645 650 655		
Val Val Ser His Asp Ala Phe Ala Asn Leu Val Leu Asp Gln Arg Arg 660 665 670		

Leu Gly Ile Gly Pro Gly Ser Arg Val Ala Gln Phe Ala Ser Pro Gly
 675 680 685
 Phe Asp Met Phe Val Asp Glu Trp Ser Met Ala Leu Leu Ala Gly Ala
 690 695 700
 Ala Leu Val Ile Val Pro Pro Glu Arg Arg Leu Gly Ala Asp Leu Ala
 705 710 715 720
 Ala Phe Leu Thr Glu Arg Gly Val Thr His Ala Thr Leu Pro Pro Ala
 725 730 735
 Val Val Ala Thr Leu Pro Glu Glu Ser Leu Pro Arg Ser Phe Val Leu
 740 745 750
 Asp Ile Gly Gly Asp Ala Leu Pro Asp Asp Leu Ala Arg Arg Trp Leu
 755 760 765
 Arg Asp Gly Arg Trp Leu Gly Asn Ser Tyr Gly Pro Thr Glu Thr Thr
 770 775 780
 Val Asn Ala Ala Thr Trp Arg Cys Glu Pro Gly Thr Trp Glu Gly Ala
 785 790 795 800
 Thr Pro Ile Gly Arg Pro Val Ala Asn Leu Arg Ala Tyr Val Leu Asp
 805 810 815
 Gly Arg Leu Arg Pro Val Pro Val Gly Val Glu Gly Glu Leu Tyr Val
 820 825 830
 Ser Gly Ala Gly Leu Ala Arg Gly Tyr Leu Asn Arg Ala Gly Leu Thr
 835 840 845
 Ala Gly Ser Phe Val Ala Cys Pro Phe Glu Pro Gly Glu Arg Met Tyr
 850 855 860
 Arg Thr Gly Asp Ile Val Arg Trp Asp Ala Arg Gly Arg Leu Val Tyr
 865 870 875 880
 Ala Gly Arg Ala Asp Asp Gln Ala Lys Ile Arg Gly Phe Arg Val Glu
 885 890 895
 Pro Gly Glu Val Glu Ala Val Leu Ala Ala Gly Pro Gly Val Asn Gln
 900 905 910
 Val Ala Val Ile Val Arg Glu Asp Val Pro Gly Asp Lys Arg Leu Val
 915 920 925
 Ala Tyr Val Val Gly Gly Asp Val Glu Thr Leu Arg Ser Tyr Ala Gln
 930 935 940
 Gln Arg Leu Pro Gly Tyr Leu Val Pro Ser Ala Ile Val Ala Leu Ala
 945 950 955 960
 Glu Leu Pro Leu Thr Pro Ser Ala Lys Val Asp Arg Arg Ala Leu Pro
 965 970 975
 Val Pro Asp Tyr Gly Arg Asp Ala Gly Gly Gly Arg Ala Pro Ala Asn
 980 985 990

Ala Arg Glu Glu Val Leu Cys Arg	Ala Phe Ala Glu Val Leu Gly Val
995	1000 1005
Glu Arg Val Gly Val Glu Asp Asp Phe Phe Ala Leu Gly Gly His	
1010	1015 1020
Ser Leu Leu Val Val Ser Leu Val Glu Arg Leu Arg Arg Gln Gly	
1025	1030 1035
Ile Ser Val Pro Val Arg Ala Leu Phe Thr Thr Pro Thr Pro Ala	
1040	1045 1050
Gly Leu Ala Glu Ala Val Gly Asp Gly Ala Val Val Val Pro Pro	
1055	1060 1065
Asn Leu Ile Pro Glu Gly Ala Ala Glu Leu Thr Pro Glu Met Leu	
1070	1075 1080
Pro Leu Ala Asp Leu Thr Ala Asp Glu Leu Ala Val Val Val Asp	
1085	1090 1095
Ser Val Pro Gly Gly Ala Ala Asn Ile Ala Asp Val Tyr Pro Leu	
1100	1105 1110
Ala Pro Leu Gln Glu Gly Ile Phe Phe His His Met Met Ala Asp	
1115	1120 1125
Arg Asp Ser Ala Asp Val Tyr Val Thr Pro Thr Val Val Glu Phe	
1130	1135 1140
Asp Ser Arg Asp Arg Leu Asp Gly Phe Leu Ala Ala Leu Gln Gln	
1145	1150 1155
Val Val Asp Arg Thr Asp Val Tyr Arg Thr Ser Val Val Trp Gln	
1160	1165 1170
Gly Leu Arg Glu Pro Val Gln Val Val Trp Arg His Ala Arg Leu	
1175	1180 1185
Pro Val Asp Glu Val Val Leu Arg Asp Asp Leu Asp Pro Val Glu	
1190	1195 1200
Gln Leu Asn Ala Leu Gly Thr Ala Trp Met Asp Leu Ser Glu Ala	
1205	1210 1215
Pro Leu Val Gln Ala Val Val Ala Ala Arg Pro Gly Asp Pro Gln	
1220	1225 1230
Arg Trp Leu Ala Val Leu Arg Ile His His Leu Val Gln Asp His	
1235	1240 1245
Thr Ala Leu Asp Ile Leu Leu Glu Glu Leu Ala Ala Tyr Leu Ala	
1250	1255 1260
Gly Arg Gly Gly Asp Leu Pro Glu Pro Val Pro Phe Arg Glu Phe	
1265	1270 1275
Val Ala His Thr Arg Leu Gly Val Pro Arg Glu Glu His Glu Arg	
1280	1285 1290
Tyr Phe Ala Gly Leu Leu Gly Asp Val Thr Glu Thr Thr Ala Pro	

Tyr Gly	Leu Leu Asp Val His	Ser Gly Gly Leu Ala	Ser Ala Gln
1310	1315	1320	
Ala His	Leu Arg Leu Asp Gly	Pro Leu Gly Arg Arg	Val Ala Ala
1325	1330	1335	
Phe Ala	Arg Glu His Gly Val	Ser Pro Ala Thr Leu	Phe His Leu
1340	1345	1350	
Ala Trp	Ala Arg Val Leu Gly	Thr Leu Ala Gly Arg	Asp Asp Val
1355	1360	1365	
Val Phe	Gly Thr Val Leu Phe	Gly Arg Met Asn Ser	Gly Ala Gly
1370	1375	1380	
Ala Asp	Arg Val Pro Gly Leu	Phe Ile Asn Thr Leu	Pro Val Arg
1385	1390	1395	
Val Arg	Leu Gly Ala Pro Val	Gly Asp Ala Leu Asp	Gly Leu Arg
1400	1405	1410	
Asp Gln	Leu Ile Glu Leu Ile	Ala His Glu His Ala	Pro Leu Ala
1415	1420	1425	
Val Ala	Gln Gln Ala Ala Asn	Leu Phe Gly Arg Pro	Leu Phe Thr
1430	1435	1440	
Ser Ile	Phe Asn Tyr Arg Tyr	Ala Arg Gly Ala Glu	Pro Ala Gly
1445	1450	1455	
Ala Ala	Leu Asp Gly Ile Arg	Leu Leu Ser Ala Arg	Asp Leu Thr
1460	1465	1470	
Asn Tyr	Pro Leu Ala Val Ala	Val Asp Ala Glu Gly	Asp Thr Phe
1475	1480	1485	
Ser Leu	Thr Val Asp Ala Val	Ala Pro Ala Asp Pro	Val Gln Val
1490	1495	1500	
Gly Glu	Leu Leu Val Thr Ala	Leu Arg Asn Leu Thr	Arg Thr Ala
1505	1510	1515	
Glu Asn	Ala Pro Gly Thr Pro	Leu Ala Ala Val Gly	Val Leu Gly
1520	1525	1530	
Glu Asp	Glu Leu Ser Arg Val	Val Ser Gly Trp Asn	Asp Thr Ala
1535	1540	1545	
Arg Arg	Val Arg Gln Ala Ser	Val Pro Glu Leu Phe	Ala Glu Arg
1550	1555	1560	
Val Ala	Ala Ala Pro Gly Ala	Pro Ala Val Ala Ala	Gly Asp Leu
1565	1570	1575	
Arg Trp	Thr Tyr Ala Asp Leu	Asp Ala Arg Ser Asp	Ala Leu Ala
1580	1585	1590	
Arg Ser	Leu Val Ala Ala Gly	Val Thr Ala Glu Ser	Pro Val Val
1595	1600	1605	

Val	Ala	Leu	Glu	Arg	Ser	Ala	Asp	Val	Leu	Thr	Ala	Phe	Leu	Ala
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Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp	Leu	Ser	Trp
1625						1630					1635			
Pro	Arg	Ala	Arg	Val	Asp	Ala	Val	Ile	Ala	Asp	Cys	Ala	Ala	Trp
1640						1645					1650			
Ile	Ala	Val	Ala	Asp	Arg	Pro	Met	Thr	Gly	Leu	Thr	Val	Val	Pro
1655						1660					1665			
Ala	Asn	Arg	Ala	Gly	Asp	Pro	Ala	Val	Ala	Leu	Pro	Pro	Arg	Pro
1670						1675					1680			
Leu	Pro	Gly	Ala	Ala	Ala	Tyr	Arg	Met	Tyr	Thr	Ser	Gly	Ser	Thr
1685						1690					1695			
Gly	Arg	Pro	Lys	Gly	Val	Val	Thr	Thr	His	Gln	Asn	Val	Val	Asp
1700						1705					1710			
Leu	Val	Thr	Asp	Arg	Cys	Trp	Gly	Pro	Thr	Pro	Arg	Val	Leu	Phe
1715						1720					1725			
His	Ala	Pro	His	Ala	Phe	Asp	Ala	Ser	Ser	Phe	Glu	Leu	Trp	Val
1730						1735					1740			
Pro	Leu	Leu	Thr	Gly	Gly	Thr	Val	Val	Val	Ala	Pro	Gly	Glu	Ser
1745						1750					1755			
Ile	Asp	Thr	Gly	Val	Leu	Arg	Gln	Leu	Ile	Arg	Ala	His	Glu	Leu
1760						1765					1770			
Thr	His	Val	His	Val	Thr	Ala	Gly	Leu	Leu	Arg	Val	Leu	Ala	Glu
1775						1780					1785			
Asp	Pro	Ser	Cys	Phe	Ala	Gly	Leu	Thr	Glu	Val	Leu	Thr	Gly	Gly
1790						1795					1800			
Asp	Val	Val	Pro	Ala	Glu	Ala	Val	Arg	Arg	Val	Leu	Asp	Ala	Asn
1805						1810					1815			
Pro	Gly	Val	Arg	Val	Arg	Gln	Leu	Tyr	Gly	Pro	Thr	Glu	Val	Thr
1820						1825					1830			
Leu	Cys	Ala	Thr	Gln	His	Val	Val	Arg	Glu	Pro	Ser	Pro	Val	Leu
1835						1840					1845			
Pro	Ile	Gly	Arg	Pro	Leu	Asp	Asn	Thr	Arg	Val	Tyr	Val	Leu	Asp
1850						1855					1860			
Gly	Leu	Leu	Gln	Pro	Val	Pro	Val	Gly	Val	Thr	Gly	Glu	Leu	Tyr
1865						1870					1875			
Ile	Ala	Gly	Ala	Gly	Val	Ala	Arg	Gly	Tyr	Ala	Asp	Met	Pro	Gly
1880						1885					1890			
Thr	Thr	Ala	Glu	Arg	Phe	Val	Ala	Asp	Pro	Phe	Thr	Ala	Gly	Gly
1895						1900					1905			

Arg	Leu	Tyr	Arg	Thr	Gly	Asp	Leu	Val	Arg	Trp	Thr	Gly	Glu	Gly
1910						1915					1920			
Glu	Leu	Val	Phe	Ala	Gly	Arg	Ala	Asp	Asp	Gln	Val	Lys	Ile	Arg
1925						1930					1935			
Gly	Tyr	Arg	Val	Glu	Pro	Gly	Glu	Val	Glu	Ala	Val	Leu	Ala	Ala
1940						1945					1950			
Leu	Pro	Gly	Val	Ser	Gln	Ala	Ala	Val	Ile	Val	Arg	Glu	Asp	Val
1955						1960					1965			
Pro	Gly	Asp	Lys	Arg	Leu	Val	Ala	Tyr	Leu	Val	Ala	Ala	Pro	Glu
1970						1975					1980			
Thr	Val	Glu	Ala	Ala	Arg	Ala	His	Ala	Glu	Gln	Arg	Leu	Pro	Ser
1985						1990					1995			
Tyr	Leu	Val	Pro	Ser	Ala	Phe	Val	Gln	Leu	Asp	Ala	Leu	Pro	Leu
2000						2005					2010			
Thr	Gly	Asn	Gln	Lys	Val	Asp	Arg	Ala	Ala	Leu	Pro	Ala	Pro	Leu
2015						2020					2025			
Gly	Phe	Glu	Ala	Gly	Ala	Gly	Arg	Ala	Pro	Ala	Asp	Ala	Arg	Glu
2030						2035					2040			
Glu	Leu	Val	Gly	Ala	Ala	Phe	Ala	Glu	Val	Leu	Asp	Leu	Gly	Arg
2045						2050					2055			
Val	Gly	Pro	Asp	Asp	Asp	Phe	Phe	Ala	Leu	Gly	Gly	His	Ser	Leu
2060						2065					2070			
Leu	Ala	Leu	Ala	Leu	Val	Glu	Arg	Leu	Arg	Arg	Gln	Gly	Leu	Gly
2075						2080					2085			
Val	Ser	Val	Arg	Ala	Val	Phe	Asp	Ala	Arg	Thr	Pro	Ala	Ala	Leu
2090						2095					2100			
Thr	Arg	Arg	Gly	Asp	Gly	Gly	Ala	Asp	Asp	Arg	Pro	Ala	Leu	Arg
2105						2110					2115			
Ala	Gly	Ala	Arg	Pro	Ala	Arg	Leu	Pro	Leu	Ser	Tyr	Ala	Gln	Arg
2120						2125					2130			
Arg	Leu	Trp	Phe	Leu	Ala	Gln	Leu	Glu	Gly	Pro	Ser	Ala	Thr	Tyr
2135						2140					2145			
Asn	Ile	Pro	Val	Ala	Leu	Arg	Leu	Glu	Gly	Asp	Leu	Asp	Arg	Asp
2150						2155					2160			
Ala	Leu	Thr	Ala	Ala	Leu	Arg	Asp	Val	Val	Ala	Arg	His	Glu	Val
2165						2170					2175			
Leu	Arg	Thr	Val	Phe	Thr	Val	Ala	Asp	Gly	Glu	Pro	Trp	Gln	His
2180						2185					2190			
Ile	Leu	Asp	Pro	Ala	Arg	Ala	Glu	Pro	Ala	Leu	Pro	Val	Val	Asp
2195						2200					2205			
Val	Pro	Ala	Gly	Arg	Val	Glu	Glu	Ala	Val	Ala	Glu	Ala	Ala	Ala

2210	2215	2220
Tyr Ala Phe Asp Leu Ala Arg 2225	Glu Ile Pro Leu Arg 2230	Ala Val Leu 2235
Leu Ala Pro Gly Asp Gly Thr 2240	His Val Leu Val 2245	Leu Val Leu His 2250
His Ile Ala Ala Asp Gly Trp 2255	Ser Met Arg Pro 2260	Leu Ala Arg Asp 2265
Leu Ala Thr Ala Tyr Ala Ala 2270	Arg Arg Arg Gly 2275	Gln Ala Pro Glu 2280
Ser Glu Thr Leu Pro Val Gln 2285	Tyr Ala Asp Tyr 2290	Ala Leu Trp Gln 2295
Arg Asp Leu Leu Gly Ser Asp 2300	Ser Asp Pro Ala 2305	Ser Leu Ile Ser 2310
Arg Gln Ile Ala His Trp Arg 2315	Glu Arg Leu Asp 2320	Gly Val Pro Glu 2325
Glu Leu Asp Leu Pro Ala Asp 2330	Arg Pro Arg Pro 2335	Ala Ala Ala Ser 2340
His Arg Gly His Leu His Ser 2345	Ala Glu Ile Pro 2350	Ala Asp Val His 2355
Arg Ser Leu Arg Arg Val Ala 2360	Ala Asp His Gly 2365	Ala Thr Val Phe 2370
Met Thr Leu Gln Ala Ala Val 2375	Ala Val Leu Leu 2380	Ser Arg Leu Gly 2385
Ala Gly Thr Asp Val Pro Ile 2390	Gly Thr Val Val 2395	Ala Gly Arg Ala 2400
Asp Arg Ala Leu Glu Asn Leu 2405	Val Gly Phe Phe 2410	Val Asn Thr Leu 2415
Val Leu Arg Thr Asp Leu Thr 2420	Gly Asp Pro Arg 2425	Leu Thr Asp Val 2430
Leu Gly Gln Val Arg Glu Leu 2435	Thr Leu Arg Ala 2440	Leu Ala His Gln 2445
Asp Val Pro Phe Glu Lys Leu 2450	Val Glu Glu Leu 2455	Thr Pro Ala Arg 2460
Ser Leu Ala Arg His Pro Leu 2465	Phe Gln Val Met 2470	Val Thr Leu Asp 2475
Gly Gly Gly Pro Asp Gly Ala 2480	Glu Leu Pro Gly 2485	Leu Ala Met Ser 2490
Val Val Pro Thr Gly Ala Val 2495	Pro Ala Lys Phe 2500	Asp Leu Asp Leu 2505
Thr Phe Thr Glu Thr Phe Asp 2510	Ala Ala Gly Glu 2515	Pro Ala Gly Leu 2520

Arg Val	Asp Leu	Ile Ala	Ala Ala	Ala Asp	Leu Phe	Asp Ala	Gly Thr		
2525			2530			2535			
Ala Ala	Arg Leu	Ala Gly	Tyr Leu	Ser Arg	Val Leu	Gly Val	Leu		
2540			2545			2550			
Ala Ala	Asp Pro	Arg Arg	Arg Leu	Ala Glu	Val Asp	Pro Leu	Glu		
2555			2560			2565			
Ala Glu	Glu Ser	Arg Leu	Met Leu	Ala Ala	Gly Glu	Glu Pro	Ala		
2570			2575			2580			
Pro Ala	Leu Pro	Glu Ile	Thr Val	Ala Ala	Leu Val	Ala Glu	Gln		
2585			2590			2595			
Cys Ala	Arg Thr	Pro Gly	Ala Val	Ala Val	Thr Gly	Pro Asp	Ala		
2600			2605			2610			
Ser Leu	Thr Tyr	Ala Glu	Leu Asp	Glu Arg	Ala Ala	Arg Ile	Ala		
2615			2620			2625			
Arg Trp	Leu Arg	Arg His	Gly Ala	Gly Pro	Gly Ala	Ala Val	Cys		
2630			2635			2640			
Val Leu	Met Glu	Arg Ser	Ala Glu	Leu Val	Ala Val	Leu Leu	Gly		
2645			2650			2655			
Val Met	Arg Ala	Gly Ala	Ala Tyr	Val Pro	Val Asp	Pro Ala	Tyr		
2660			2665			2670			
Pro Ala	Glu Arg	Ile Arg	Phe Val	Val Thr	Asp Ala	Arg Ala	Ala		
2675			2680			2685			
Cys Val	Val Ser	Glu Ser	Ala Ser	Ala Gly	Leu Val	Pro Asp	Gly		
2690			2695			2700			
Val Pro	Cys Leu	Ala Ile	Asp Asp	Pro Gly	Asp Ala	Ala Glu	Pro		
2705			2710			2715			
Ala Glu	Pro Gly	Asp Asp	Pro Gly	Asp Ala	Ala Gly	Pro Arg	Pro		
2720			2725			2730			
Asp Asp	Pro Ala	Tyr Ile	Ile Tyr	Thr Ser	Gly Ser	Thr Gly	Thr		
2735			2740			2745			
Pro Lys	Gly Val	Val Val	Ser His	Arg Asn	Val Val	Ala Leu	Leu		
2750			2755			2760			
Thr Ala	Thr Arg	Pro Leu	Phe Gly	Phe Ala	Gly Asp	Glu Val	Trp		
2765			2770			2775			
Ser Trp	Phe His	Ser Val	Ala Phe	Asp Phe	Ser Val	Trp Glu	Leu		
2780			2785			2790			
Trp Gly	Ala Leu	Thr His	Gly Gly	Arg Val	Val Val	Val Pro	Tyr		
2795			2800			2805			
Ala Val	Ser Arg	Ser Pro	Arg Asp	Phe Trp	Glu Leu	Val Val	Arg		
2810			2815			2820			

Glu Gly Val Thr Val Leu Ser Gln Thr Pro Ser Ala Phe Ala Gln	2825	2830	2835
Leu Met Ala Ala Ala Gly Asp Asp Asp Arg Asp Ala Leu Arg Phe	2840	2845	2850
Val Val Phe Gly Gly Glu Ala Leu Asp Pro Gly Arg Leu Ala Gly	2855	2860	2865
Trp Leu Ala Arg Arg Pro Asp Lys Pro Arg Leu Val Asn Met Tyr	2870	2875	2880
Gly Ile Thr Glu Thr Thr Val His Thr Thr Tyr Gln His Ile Ala	2885	2890	2895
Pro Gly Thr Thr Gly Ser Val Ile Gly Arg Gly Leu Pro Gly Phe	2900	2905	2910
Gly Leu Tyr Val Leu Asp Glu Ala Leu Arg Pro Val Pro Ala Gly	2915	2920	2925
Val Pro Gly Glu Val Tyr Ala Arg Gly Pro Gln Val Ala Arg Gly	2930	2935	2940
Tyr Ile Gly Arg Pro Gly Leu Thr Ala Glu Arg Phe Val Ala Ser	2945	2950	2955
Pro Phe Ala Pro Gly Glu Arg Met Tyr Arg Thr Gly Asp Val Ala	2960	2965	2970
Arg Trp Thr Ala Asp Gly Arg Leu Val Phe Ala Gly Arg Ser Asp	2975	2980	2985
Asp Gln Ile Lys Ile Arg Gly Phe Arg Ile Glu Pro Gly Glu Val	2990	2995	3000
Glu Ala Val Leu Ala Ala Gly Pro Gly Val Ser Gln Ala Ala Val	3005	3010	3015
Ile Val Arg Glu Asp Val Pro Gly Asp Lys Arg Leu Val Ala Tyr	3020	3025	3030
Val Val Gly Gly Asp Ala Glu Thr Leu Arg Ser His Ala Gln Gln	3035	3040	3045
Arg Leu Pro Gly Tyr Leu Val Pro Ser Ala Phe Val Glu Leu Asp	3050	3055	3060
Arg Leu Pro Leu Thr Val Asn Gly Lys Leu Asp Arg Arg Ala Leu	3065	3070	3075
Pro Val Pro Asp Tyr Gly Arg Asp Ala Gly Gly Gly Arg Ala Pro	3080	3085	3090
Ala Asn Ala Arg Glu Glu Val Leu Cys Arg Ala Phe Ala Glu Val	3095	3100	3105
Leu Gly Val Glu Arg Val Gly Val Glu Asp Asp Phe Phe Ala Leu	3110	3115	3120
Gly Gly His Ser Leu Leu Val Val Ser Leu Val Glu Arg Leu Arg			

3125	3130	3135
Arg Gln Gly Ile Ser Val Pro 3140	Val Arg Ala Leu Phe 3145	Thr Thr Pro 3150
Thr Pro Ala Gly Leu Ala Glu 3155	Ala Val Gly Asp Gly 3160	Ala Val Val 3165
Val Pro Pro Asn Leu Ile Pro 3170	Glu Asp Ala Ala Glu 3175	Leu Thr Pro 3180
Glu Met Leu Pro Leu Ala Asp 3185	Leu Thr Ala Asp Glu 3190	Leu Ala Val 3195
Val Val Ala Ser Val Pro Gly 3200	Gly Ala Ala Asn Ile 3205	Ala Asp Val 3210
Tyr Pro Leu Ala Pro Leu Gln 3215	Glu Gly Ile Phe Phe 3220	His His Met 3225
Met Ala Asp Arg Asp Ser Ala 3230	Asp Val Tyr Val Thr 3235	Pro Thr Val 3240
Val Glu Phe Asp Ser Arg Asp 3245	Arg Leu Asp Gly Phe 3250	Leu Ala Ala 3255
Leu Gln Gln Val Val Asp Arg 3260	Thr Asp Val Tyr Arg 3265	Thr Ser Val 3270
Val Trp Gln Gly Leu Arg Glu 3275	Pro Val Gln Val Val 3280	Trp Arg His 3285
Ala Arg Leu Pro Ile Asp Glu 3290	Val Glu Leu His Glu 3295	Gly Thr Asp 3300
Pro Ala Glu Gln Leu Ile Ala 3305	Leu Ala Thr Glu Arg 3310	Val Asp Leu 3315
Asp Arg Ala Pro Leu Ile Arg 3320	Thr Thr Thr Ala Ala 3325	Val Pro Gly 3330
Ser Gly Arg Trp Leu Ala Leu 3335	Leu Arg Ile His His 3340	Leu Val Gln 3345
Asp His Thr Thr Leu Asp Val 3350	Leu Leu Gly Glu Leu 3355	Arg Ala Phe 3360
Leu Glu Gly Arg Gly Asp Glu 3365	Leu Pro Glu Pro Val 3370	Pro Phe Arg 3375
Glu Phe Val Ala Gln Ala Arg 3380	Leu Gly Val Pro Arg 3385	Glu Glu His 3390
Glu Arg Tyr Phe Ala Glu Leu 3395	Leu Gly Asp Val Thr 3400	Glu Thr Thr 3405
Ala Pro Tyr Gly Leu Thr Glu 3410	Val His Gly Asp Gly 3415	Ser Ala Ala 3420
Val His Ser Arg Arg Glu Val 3425	Asp Asp Asp Leu Ala 3430	Ala Arg Leu 3435

His	Arg	Leu	Ala	Arg	Ser	Leu	Gly	Val	Ser	Pro	Ala	Ala	Leu	Phe
3440						3445					3450			
His	Leu	Ala	Trp	Ala	Arg	Val	Leu	Gly	Ala	Val	Ser	Gly	Arg	Asp
3455						3460					3465			
Asp	Val	Val	Phe	Gly	Thr	Val	Leu	Phe	Gly	Arg	Met	Asn	Ser	Gly
3470						3475					3480			
Ala	Ala	Ala	Asp	Arg	Val	Gln	Gly	Leu	Phe	Ile	Asn	Thr	Leu	Pro
3485						3490					3495			
Val	Arg	Val	Arg	Leu	Ala	Ala	Gly	Ser	Thr	Arg	Asp	Ala	Leu	Thr
3500						3505					3510			
Gly	Leu	Arg	Asp	Gln	Leu	Ala	Gly	Leu	Leu	Val	His	Glu	His	Ala
3515						3520					3525			
Pro	Leu	Ala	Leu	Ala	Gln	Arg	Ala	Ala	Gly	Ile	Thr	Asp	Gly	Ser
3530						3535					3540			
Pro	Leu	Phe	Ala	Ser	Ile	Phe	Asn	Tyr	Arg	His	Asn	Gln	Asp	Asp
3545						3550					3555			
Pro	Ala	Ala	Ser	Ala	Gly	Leu	Glu	Gly	Ile	Arg	Thr	Val	Tyr	Ser
3560						3565					3570			
Ala	Glu	His	Thr	Asn	Tyr	Pro	Leu	Asp	Ala	Ser	Ile	Asp	Val	Thr
3575						3580					3585			
Gly	Asp	Arg	Phe	Ala	Ile	Thr	Val	Asn	Ala	Val	Ala	Ala	Asp	Ala
3590						3595					3600			
Ala	Arg	Ile	Ala	Glu	Leu	Met	His	Thr	Cys	Leu	Gly	His	Leu	Ala
3605						3610					3615			
Asp	Val	Leu	Glu	Asp	Ala	Pro	Glu	Thr	Pro	Leu	Ser	Trp	Val	Ser
3620						3625					3630			
Pro	Leu	Ser	Ala	Glu	Asp	Leu	Gly	Arg	Ile	Val	Gly	Asp	Trp	Asn
3635						3640					3645			
Glu	Thr	Arg	Arg	Ala	Val	Thr	Arg	Ala	Ser	Val	Pro	Glu	Leu	Phe
3650						3655					3660			
Ala	Lys	Gln	Val	Ala	Ala	Thr	Pro	Asp	Ala	Ile	Ala	Val	Ala	Gly
3665						3670					3675			
Glu	Gly	Val	Ser	Trp	Ser	Tyr	Arg	Glu	Leu	Asp	Val	Arg	Ser	Asp
3680						3685					3690			
Ala	Leu	Ala	Arg	Ser	Leu	Val	Ala	Ala	Gly	Val	Gly	Ile	Glu	Ser
3695						3700					3705			
Pro	Val	Val	Val	Ala	Leu	Asp	Arg	Ser	Pro	Glu	Val	Pro	Thr	Ala
3710						3715					3720			
Phe	Leu	Ala	Val	Ala	Lys	Ala	Gly	Gly	Val	Phe	Val	Pro	Val	Asp
3725						3730					3735			

Leu Ser Trp Pro Gln Ala Arg Val Asp Ala Val Ile Ala Asp Cys	3740	3745	3750
Ala Ala Arg Val Ala Val Ala Asp Arg Pro Met Thr Gly Leu Thr	3755	3760	3765
Val Val Pro Ala Asp Ala Ala Gly Asp Pro Ala Ala Glu Leu Pro	3770	3775	3780
Pro Arg Pro Leu Pro Gly Ala Glu Val Tyr Arg Met Tyr Thr Ser	3785	3790	3795
Gly Ser Thr Gly Arg Pro Lys Gly Val Val Thr Thr His Gln Asn	3800	3805	3810
Leu Val Asp Leu Ala Thr Asp Thr Cys Trp Gly Pro Thr Pro Arg	3815	3820	3825
Val Leu Phe His Ala Pro His Ala Phe Asp Ala Ser Ser Tyr Glu	3830	3835	3840
Ile Trp Val Pro Leu Leu Asn Gly Gly Thr Val Val Val Ala Pro	3845	3850	3855
Gly Arg Ser Ile Asp Ala Ala Val Leu Gly Glu Leu Ile Arg Ala	3860	3865	3870
His Glu Leu Thr His Val His Val Thr Ala Gly Leu Leu Arg Val	3875	3880	3885
Leu Asp Pro Ser Cys Phe Ala Gly Leu Thr Glu Val Leu Thr Gly	3890	3895	3900
Gly Asp Ala Val Ser Ala Glu Ala Val Arg Arg Val Met Glu Ala	3905	3910	3915
Asn Pro Gly Leu Arg Val Arg Gln Leu Tyr Gly Pro Thr Glu Val	3920	3925	3930
Thr Leu Cys Ala Thr Gln Gln Val Leu Asp Gly Thr Gly Val Pro	3935	3940	3945
Ile Gly Arg Pro Leu Asp Asn Thr Arg Val Tyr Val Leu Asp Asp	3950	3955	3960
Leu Leu Gln Pro Val Pro Val Gly Val Thr Gly Glu Leu Tyr Val	3965	3970	3975
Ala Gly Ala Gly Leu Ala Arg Gly Tyr Ala Gly Met Pro Gly Leu	3980	3985	3990
Thr Ala Glu Arg Phe Val Ala Asp Pro Phe Ser Ser Gly Gly Arg	3995	4000	4005
Leu Tyr Arg Thr Gly Asp Leu Val Arg Trp Thr Asp Asp Gly Val	4010	4015	4020
Leu Val Phe Ala Gly Arg Ala Asp Asp Gln Val Lys Ile Arg Gly	4025	4030	4035
Tyr Arg Val Glu Pro Gly Glu Val Glu Ala Val Leu Ala Ala His			

4040	4045	4050
Pro Asp Val Ala Gln Val Ala Val Val Val Arg Glu Asp Thr Pro 4055 4060 4065		
Gly Asp Lys Arg Leu Val Ala Tyr Val Val Gly Gly Asp Val Glu 4070 4075 4080		
Ala Tyr Ala Gln Glu Arg Leu Pro Gly Tyr Leu Val Pro Ser Ala 4085 4090 4095		
Phe Val His Leu Asp Ala Leu Pro Leu Thr Ser Asn Gln Lys Val 4100 4105 4110		
Asp Arg Ala Ala Leu Pro Ala Pro Ser Val Glu Ser Gly Ala Gly 4115 4120 4125		
Arg Ala Pro Ala Asp Ala Arg Glu Glu Leu Met Cys Ala Ala Phe 4130 4135 4140		
Ala Glu Val Leu Asp Leu Asp Arg Val Gly Val Asp Asp Asp Phe 4145 4150 4155		
Phe Ala Leu Gly Gly His Ser Leu Leu Val Val Arg Leu Val Gly 4160 4165 4170		
Arg Ile Arg Gln Val Phe Gly Val Glu Val Ser Ala Arg Leu Val 4175 4180 4185		
Phe Asp Ala Arg Thr Pro Ala Gly Val Val Ala Arg Leu Ser Glu 4190 4195 4200		
Gly Gly Thr Ala Arg Glu Ala Val Arg Ala Arg Val Arg Pro Ala 4205 4210 4215		
Arg Val Pro Leu Ser Phe Ala Gln Arg Arg Leu Trp Phe Leu Ser 4220 4225 4230		
Gln Leu Asp Gly Thr Ser Thr Thr Tyr Asn Ile Pro Val Ala Leu 4235 4240 4245		
Gln Leu Asp Gly Pro Leu Asp Arg Asp Ala Phe Thr Ala Ala Leu 4250 4255 4260		
His Asp Val Val Ala Arg His Glu Val Leu Arg Thr Val Phe Thr 4265 4270 4275		
Val Ala Asp Gly Glu Pro Trp Gln His Ile Leu Asp Thr Pro Ser 4280 4285 4290		
Val Ser Val Pro Val Ile Glu Val Pro Ala Asp Gly Leu Pro Glu 4295 4300 4305		
Ala Val Ala Ala Ala Ala Ala His Thr Phe Asp Leu Ser Arg Glu 4310 4315 4320		
Ile Pro Leu Arg Ala Val Leu Leu Ala Thr Gly Ala Asp Arg His 4325 4330 4335		
Val Leu Val Leu Val Val His His Ile Ala Ala Asp Gly Trp Ser 4340 4345 4350		

Met	Gln	Pro	Leu	Ala	Arg	Asp	Leu	Ala	Val	Ala	Tyr	Ala	Ala	Arg
4355						4360					4365			
Ile	Arg	Gly	Glu	Ala	Pro	Ala	Trp	Thr	Ala	Leu	Pro	Val	Gln	Tyr
4370						4375					4380			
Ala	Asp	Tyr	Ala	Leu	Trp	Gln	Arg	Asp	Val	Leu	Gly	Ser	Glu	His
4385						4390					4395			
Asp	Pro	Asp	Ser	Ala	Ile	Ser	Gln	Gln	Val	Ala	His	Trp	Arg	Arg
4400						4405					4410			
Gln	Leu	Ala	Gly	Ala	Pro	Asp	Glu	Leu	Pro	Leu	Pro	Ala	Asp	His
4415						4420					4425			
Pro	Arg	Pro	Ala	Glu	Ala	Thr	Tyr	Arg	Gly	His	Thr	Val	Glu	Phe
4430						4435					4440			
Thr	Val	Pro	Pro	Ala	Val	His	His	Gln	Leu	Ala	Glu	Leu	Ala	Arg
4445						4450					4455			
Arg	Asn	Gly	Val	Thr	Val	Phe	Met	Thr	Val	Gln	Thr	Ala	Leu	Ala
4460						4465					4470			
Val	Leu	Leu	Ser	Lys	Leu	Gly	Ala	Gly	Thr	Asp	Ile	Pro	Ile	Gly
4475						4480					4485			
Val	Ala	Val	Ala	Gly	Arg	Thr	Asp	Pro	Thr	Leu	Asp	Asn	Leu	Ile
4490						4495					4500			
Gly	Phe	Phe	Val	Asn	Thr	Leu	Val	Leu	Arg	Thr	Asp	Leu	Thr	Gly
4505						4510					4515			
Asn	Pro	Thr	Ile	Thr	Asp	Leu	Leu	His	Arg	Thr	Arg	Asp	Thr	Thr
4520						4525					4530			
Leu	His	Ala	Phe	Thr	His	Gln	Asp	Val	Pro	Phe	Glu	Lys	Leu	Val
4535						4540					4545			
Glu	Asp	Leu	Ala	Pro	Thr	Arg	Ser	Leu	Ala	Arg	His	Pro	Leu	Phe
4550						4555					4560			
Gln	Val	Met	Met	Thr	Leu	Gln	Ser	Thr	Gly	Arg	Ala	Gly	Glu	Ala
4565						4570					4575			
Ala	Glu	Leu	Pro	Gly	Leu	Glu	Thr	Ala	Val	Leu	Ser	Pro	Gly	Gly
4580						4585					4590			
Val	Ala	Ala	Lys	Val	Asp	Leu	Asp	Leu	Ser	Leu	Ser	Glu	Ala	Tyr
4595						4600					4605			
Asp	Asp	Asp	Gly	Arg	Pro	Ala	Gly	Leu	Ala	Gly	Thr	Leu	Val	Ala
4610						4615					4620			
Ala	Ala	Asp	Leu	Phe	Glu	His	Gly	Thr	Ala	Glu	Arg	Ile	Ala	Gly
4625						4630					4635			
Tyr	Leu	Ala	Arg	Leu	Leu	Ala	Val	Leu	Pro	Ala	Asp	Pro	Gly	Ala
4640						4645					4650			

Arg	Leu	Gly	Asp	Val	Asp	Leu	Leu	Asp	Gly	Glu	Glu	Arg	Arg	Leu
4655						4660					4665			
Val	Leu	Thr	Gly	Trp	Asn	Asp	Thr	Thr	Ala	Ala	Val	Pro	Ala	Val
4670						4675					4680			
Ala	Val	Pro	Glu	Leu	Ile	Glu	Arg	Arg	Ala	Ala	Ala	Glu	Pro	Glu
4685						4690					4695			
Ala	Gly	Ala	Val	Trp	Cys	Gly	Asp	Thr	His	Leu	Arg	Tyr	Gly	Glu
4700						4705					4710			
Leu	Asn	Ala	Arg	Ala	Asn	Arg	Leu	Ala	Arg	Leu	Leu	Val	Glu	Arg
4715						4720					4725			
Gly	Ala	Gly	Pro	Glu	Ser	Ile	Val	Ala	Val	Cys	Leu	Glu	Arg	Ser
4730						4735					4740			
Ala	Asp	Leu	Val	Val	Thr	Leu	Leu	Ala	Val	Leu	Lys	Thr	Gly	Ala
4745						4750					4755			
Ala	Tyr	Leu	Pro	Ile	Asp	Pro	Gly	Tyr	Pro	Ala	Gly	Arg	Ile	Ala
4760						4765					4770			
Tyr	Met	Leu	Ala	Asp	Ala	Arg	Pro	Ala	Leu	Leu	Val	Thr	Ser	Pro
4775						4780					4785			
Ala	Val	Ala	Ser	Gly	Asp	Ser	Leu	Pro	Asp	Gly	Gly	Ala	Gln	Arg
4790						4795					4800			
Ile	Val	Leu	Gly	Asp	Pro	Asp	Thr	Ala	Ala	Ala	Leu	Asp	Gly	Leu
4805						4810					4815			
Ala	Gly	Thr	Asp	Leu	Leu	Val	Ser	Glu	Arg	Arg	Gly	Val	Thr	His
4820						4825					4830			
Pro	Ala	His	Pro	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly
4835						4840					4845			
Arg	Pro	Lys	Gly	Val	Val	Val	Pro	His	Gly	Ala	Leu	Thr	Asn	Phe
4850						4855					4860			
Val	Ala	Ala	Met	Ser	Asp	Arg	Leu	Ala	Leu	Gly	Ala	Gly	Asp	Arg
4865						4870					4875			
Leu	Leu	Ala	Val	Thr	Thr	Val	Ala	Phe	Asp	Ile	His	Val	Leu	Glu
4880						4885					4890			
Leu	Tyr	Val	Pro	Leu	Val	Gly	Gly	Ala	Gly	Val	Val	Val	Ala	Glu
4895						4900					4905			
Asp	Ala	Val	Val	Arg	Asp	Pro	Ala	Ala	Val	Ala	Ala	Leu	Leu	Asp
4910						4915					4920			
Arg	His	Ala	Val	Thr	Ile	Val	Gln	Ala	Thr	Pro	Ala	Leu	Trp	Gln
4925						4930					4935			
Ala	Leu	Leu	Ala	Gly	His	Ala	Asp	Ala	Val	Arg	Asp	Val	Arg	Leu
4940						4945					4950			
Leu	Val	Gly	Gly	Glu	Ala	Leu	Pro	Pro	Ala	Leu	Ala	Gly	Arg	Met

4955	4960	4965
Ala Ala Ala Gly Arg Gly Val Thr Asn Leu Tyr Gly Pro Thr Glu		
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Val Thr Val Trp Ala Thr Val Ala Asp Leu Gly Ala Ser Pro Ala		
4985	4990	4995

Gly

<210> 16
 <211> 234
 <212> PRT
 <213> Actinoplanes sp.

<400> 16

Met Gln Lys Ile Pro Leu Val Cys Val Pro Phe Ala Gly Ala Gly Ala		
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Ser Phe Phe His Pro Trp Ala Glu Leu Ala Gly Pro Asp Arg Pro Ile		
	20	25 30
Val Ala Leu Gln Leu Pro Gly Arg Glu Trp Arg Leu Leu Asp Glu Pro		
	35	40 45
Tyr Ala Asp Val Val Ala Ala Ala Ala Asp Leu Ala Leu Thr Val Ala		
	50	55 60
Asp Glu Val Gly Ala Gly Gly Arg Val Ala Leu Phe Gly His Ser Leu		
65	70	75 80
Gly Ala Val Leu Ala Tyr Glu Ile Ala His Ala Leu Val Arg Asp Gly		
	85	90 95
Glu Val Gly Val Glu Arg Leu Phe Val Ser Gly Ser Pro Asp Pro Trp		
	100	105 110
Thr Pro Arg Thr Asn Arg Ala Ser Gly Leu Asp Asp Glu Glu Phe Leu		
	115	120 125
Leu Arg Val Arg Glu Phe Ala Gly Tyr Asp His Glu Ala Leu Ala Asp		
	130	135 140
Pro Asp Met Arg Glu Leu Ile Leu Pro Ala Leu Arg Ala Asp Val Glu		
145	150	155 160
Met His Glu Ser Tyr Val Ala Gly Ser Ala Asp Pro Leu Pro Ala Pro		
	165	170 175
Val Thr Ala Leu His Ala Arg Asp Asp Ala Leu Val Ser Ala Glu Gln		
	180	185 190
Thr Ala Gly Trp Ser Lys Ala Thr Ser Gly Pro Phe Gln Leu Val Glu		
	195	200 205
Val Asp Gly Gly His Met Tyr Leu Thr Glu Asp Pro Ala Gly Leu Leu		
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Arg Leu Ile Ala Ala Asp Leu Asp Arg Asp		

225

230

<210> 17
 <211> 274
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue at
 this position

<400> 17

Val Arg Leu Thr Gly Lys Thr Ala Ile Val Thr Gly Ala Ala Arg Gly
 1 5 10 15
 Leu Gly Arg Ala Cys Ala Val Ala Phe Ala Ala Glu Gly Ala Asp Leu
 20 25 30
 Val Leu Leu Asp Arg Ala Ala Asp Leu Pro Gly Val Pro Tyr Pro Leu
 35 40 45
 Gly Thr Val Gly Gln Leu Glu His Thr Ala Asp Leu Cys Arg Lys Gln
 50 55 60
 Gly Ala Ala Val Leu Thr Val Arg Ala Asp Val Arg Asp Leu Ala Ala
 65 70 75 80
 Leu Thr Ala Ala Ala Asp Arg Ala Ile Asp Arg Phe Gly Gly Ile Asp
 85 90 95
 Val Leu Val Asn Asn Ala Gly Ile Ala Ala Pro Ser Gly Lys Val Thr
 100 105 110
 His Glu Ile Thr Glu Asp Glu Trp Gln Leu Met Ile Asp Val Asp Leu
 115 120 125
 Ser Gly Ala Trp Arg Met Thr Ala Ala Val Gly Arg His Met Thr Glu
 130 135 140
 Arg Arg Ser Gly Ser Ile Val Asn Ile Ala Ser Thr Ala Gly Gln Val
 145 150 155 160
 Gly Tyr Arg His Phe Ala Gly Tyr Val Ala Ala Lys His Gly Ile Val
 165 170 175
 Gly Leu Thr Arg Ala Ala Ala Leu Asp Tyr Ala Pro Ala Lys Val Arg
 180 185 190
 Val Asn Ala Val Cys Pro Gly Ser Val Arg Asp Asp Pro Gln Phe Glu
 195 200 205
 Gly Arg Met Leu Ser Glu Ile Ala Arg Ser Leu Asp Val Pro Val Ala
 210 215 220
 Glu His Glu Gln Thr Phe Leu Gln Ala Gln Pro Met Asn Ala Leu Ile
 225 230 235 240

Glu Pro Asp Asp Val Ala Asn Ala Ala Ile Trp Leu Ala Ser Asp Glu
 245 250 255

Ser Arg Gln Val Thr Gly Ser Val Val Thr Val Asp Gly Gly Phe Thr
 260 265 270

Thr Arg

<210> 18
 <211> 891
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V is a non-standard initiator codon. It is expected that the bio
 synthesized protein will have a formylmethionine residue at this
 position

<400> 18

Val Pro Lys Ser Gln Pro Ala Thr Arg Thr Ala Ala Pro Gly Ala Ala
 1 5 10 15

Glu Cys His Ala Leu Ala Val Arg Leu Ala Gly Pro Ile Asp Pro Ala
 20 25 30

Pro Ile Glu Arg Arg Leu Ala Ala Arg Met Pro Phe Trp His Glu His
 35 40 45

Val Ala Ala Arg Pro Gly Asp Glu Ala Ala Leu Arg Arg Arg Glu Arg
 50 55 60

Glu Leu Ala Arg Pro Val Pro Pro Glu Pro Gly Ala Arg Ala Val Leu
 65 70 75 80

Leu Ala Tyr Ala Asp Gly Ser Ala Asp Leu Val Leu Val Ala Arg Arg
 85 90 95

Asp Arg Leu Asp Arg Asp Ala Leu Ile Ala Leu Ala Arg Pro Glu Arg
 100 105 110

Ala Pro Arg Gly Arg Lys Pro Ala Glu Pro Asp Ala Pro Pro Pro Ser
 115 120 125

Ala Ala Pro Ala Trp Gly Leu Gly Asp Gly Gly Pro Asp Asp Arg Trp
 130 135 140

Ala Glu Leu Arg Val Pro Ala Arg Gly Pro Ala Asp Pro Ala Arg Trp
 145 150 155 160

Pro Ala Ala Leu Ala Lys Val Leu Ala Arg Tyr Glu Pro Gly Ala Ala
 165 170 175

Ala Gly Ser Gly Ala Ala Ala Gly Leu Gly Ala Ala Ala Gly Ser Gly
 180 185 190

Val Ala Ala Gly Ser Ser Ala Ala Ser Gly Ser Gly Ala Ala Ala Val
 195 200 205
 Pro Gly Pro Val Ala Leu Ala Phe Asp Gly Asp Leu Ala Pro Pro Asp
 210 215 220
 Glu Tyr Val Pro Phe Leu Ala Pro Thr His Pro Leu Thr Val Gln Val
 225 230 235 240
 Ser Arg Thr Pro Gly Gly Gly Thr Glu Leu Arg Cys Arg His Arg Leu
 245 250 255
 Gly Ala Val Ser Pro Ala Ala Ala Glu Ala Phe Ala Arg Met Leu Ala
 260 265 270
 Ala Ala His Gly Glu Pro Pro Ala Asp Asp Gly Ala Thr Ala Glu Pro
 275 280 285
 Thr Pro Pro Ala Ala Pro Ala Pro Ala Pro Ala Pro Ala Pro
 290 295 300
 Pro Ala Ala Ala Arg Thr Leu Thr Gly Leu Phe Ala Glu Gln Val Ala
 305 310 315 320
 Ala Arg Pro Thr Ala Val Ala Val Ser Asp Asp Arg Gly Arg His Thr
 325 330 335
 Tyr Arg Glu Leu Asp Glu Trp Ser Gly Arg Leu Ala Arg Gly Leu Arg
 340 345 350
 Lys Ala Gly Val Arg Asp Gly Asp Ala Val Gly Val Cys Leu Asp Arg
 355 360 365
 Ser Ala Glu Leu Val Ala Val Leu Leu Ala Val Leu Lys Ala Gly Ala
 370 375 380
 Ala Tyr Val Pro Leu Asp Ala Ala Tyr Pro Ala Asp Arg Ile Ala Tyr
 385 390 395 400
 Thr Val Gly Asp Ala Gly Leu Ala Val Val Val Thr Thr Ser Ala Asp
 405 410 415
 Phe Pro Asp Val Asp Gly Val Arg Leu Leu Ala Pro Glu Ser Leu Ala
 420 425 430
 Glu Ala Gly Asp Asp Pro Gly Ile Pro Leu Ala Thr Pro Ala Gly Pro
 435 440 445
 Glu Arg Pro Ala Tyr Val Ile Tyr Thr Ser Gly Ser Thr Gly Arg Pro
 450 455 460
 Lys Gly Val Val Val Pro His Ala Asn Val Ser Ala Leu Leu Asp Ala
 465 470 475 480
 Thr Arg Glu Glu Tyr Ala Leu Gly Pro Gly Asp Val Trp Thr Phe Phe
 485 490 495
 His Ser Ala Ala Phe Asp Phe Ser Val Trp Glu Ile Trp Gly Cys Leu
 500 505 510
 Leu Thr Gly Gly His Leu Val Val Val Pro Tyr Trp Val Ser Arg Ser

515	520	525
Pro Glu Gln Phe His Asp 530	Leu Leu Ala Glu Arg 535	Gly Val Thr Val Leu 540
Asn Gln Thr Pro Ser Ser 545	Phe Thr Gln Leu Val 550	Ala Ala Asp Arg Gly 560
Ala Glu Arg Asp Leu Ala Val Arg 565	Leu Val Ile Phe Gly Gly 570	Glu Pro 575
Leu Asp Ala Arg Thr Val Leu Pro 580	Trp Leu Asp Arg Arg 585	Pro Glu Ala 590
Arg Cys Arg Leu Val Asn Met Phe 595	Gly Ile Thr Glu Thr Thr 600	Val His 605
Val Thr Ala Val Asp Val Thr Arg 610	Ala Ala Ala Leu Ala Gly Ser 615	Arg 620
Ser Val Gly Arg Pro Leu Pro Gly 625	Trp Ala Val Arg Val Leu Asp 630	Glu 640
Gln Arg Arg Glu Val Pro Pro Gly 645	Val Pro Gly Glu Ile Tyr Val 650	Gly 655
Gly Ala Gly Val Ala Ile Gly Tyr 660	Leu Asn Arg Pro Glu Leu Thr 665	Ala 670
Glu Arg Phe Val Thr Gly Pro Asp 675	Gly Arg Arg Trp Tyr Arg Ser 680	Gly 685
Asp Arg Gly Arg Leu Leu Pro Asp 690	Gly Thr Leu Glu His Leu Gly 695	Arg 700
Leu Asp Asp Gln Val Lys Leu Arg 705	Gly Phe Arg Ile Glu Leu Asp 710	Glu 720
Ile Arg Gly Val Leu Thr Glu Cys 725	Ala Gly Val Ala Ala Ala Val 730	Ala 735
Val Ile Arg Arg Ser Thr Pro Asp 740	Asp Pro Ala Thr Ala Arg Leu 745	Asp 750
Ala Tyr Val Val Ala Glu Ala Gly 755	Ala Thr Pro Pro Val Ala Glu 760	His 765
Ala Ala Arg Met Leu Pro Ala Tyr 770	Met Cys Pro Ala Thr Phe Thr 775	Phe 780
Leu Asp Ala Leu Pro Met Thr Pro 785	Asn Gly Lys Val Asp Lys Ala 790	Ala 800
Leu Pro Glu Pro Ala Arg Pro Ala 805	Ala Asp Ala Ala Thr Pro Ala 810	Ala 815
Gly Pro Gly Glu Asp Gly Leu Ala 820	Gly Asp Leu Ala Asp Val Trp 825	Gln 830
Gln Val Phe Gly Cys Pro Val Thr 835	Val Ser Asp Asn Phe Phe Asp 840	Leu 845

Gly Gly Asn Ser Leu Leu Ala Val Arg Met Ala Ala Leu Met Arg Arg
 850 855 860

Arg Gly Leu Pro Arg Leu His Pro Arg Thr Leu Tyr Leu His Pro Thr
 865 870 875 880

Val Arg Gly Leu Ala Asp Ala Leu Arg Ser Ala
 885 890

<210> 19
 <211> 187
 <212> PRT
 <213> Actinoplanes sp.

<400> 19

Met Arg Asn Leu Arg Arg Thr Thr Gly Ile Gly Leu Leu Ala Leu Leu
 1 5 10 15

Ser Val Ala Ala Cys Ser Ser Thr Pro Ala Ala Ser Glu Pro Pro Pro
 20 25 30

Ser Ala Ala Pro Pro Ser Ala Val Thr Ala Thr Gly Pro Ala Ala Glu
 35 40 45

Lys Ala Val Lys Ser Gly Thr Gln Thr Tyr His Gln Ala Leu Asp Ala
 50 55 60

Phe Val Ala Ala Ser Asn Lys Gly Thr Thr Asp Thr Thr Glu Ile Gly
 65 70 75 80

Lys Tyr Ala Ser Gly Arg Ala Leu Met Thr Phe Gln Gly Ile Leu Ala
 85 90 95

Ser Tyr Gln Gln Gln Gly Val His Thr Ser Gly Glu Pro Arg Ile Asp
 100 105 110

Glu Pro Val Val Thr Gly Leu Thr Pro Pro Ala Asp Pro Thr Gly Val
 115 120 125

Gln Leu Arg Gly Cys Ile Asp Ile Ser Ala Trp Pro Leu Thr Lys Ala
 130 135 140

Asp Gly Thr Pro Ala Asp Lys Val Gly Gly Gln Gln Gly Ser Gly Pro
 145 150 155 160

Ser Ala Ile Leu Ala Asn Val Ala Arg Ser Gly Ala Thr Trp Gln Val
 165 170 175

Thr Glu Leu Ala Ile Gln Gly Pro Cys Ala Ala
 180 185

<210> 20
 <211> 415
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 20

Val	Thr	Val	Arg	Arg	Trp	Leu	Pro	Ala	Gly	Leu	Thr	Val	Leu	Ala	Phe	1	5	10	15
Ala	Ala	Gly	Phe	Trp	Gln	Lys	Leu	Pro	Cys	Gln	Ala	Ala	Gly	Trp	Pro	20	25	30	
Asp	Asp	Thr	Ala	Thr	Leu	Phe	Gly	Arg	Tyr	Cys	Tyr	Ser	Asp	Val	Pro	35	40	45	
Ile	Leu	Phe	Arg	Glu	Arg	Gly	Leu	Phe	Asp	Gly	Ile	Phe	Pro	Tyr	Glu	50	55	60	
Ser	Gly	Pro	Gly	Ala	Gln	Pro	Leu	Glu	Tyr	Pro	Val	Leu	Thr	Gly	Tyr	65	70	75	80
Leu	Met	Asp	Ala	Thr	Ala	Arg	Leu	Val	Arg	Ala	Ile	Leu	Pro	Gly	Ala	85	90	95	
Asp	Val	Ala	Val	Ala	Ser	Arg	Ala	Tyr	Phe	Leu	Thr	Thr	Val	Leu	Val	100	105	110	
Leu	Leu	Ala	Leu	Ala	Val	Leu	Thr	Val	Trp	Ala	Thr	Gly	Ala	Val	Leu	115	120	125	
Arg	Arg	Thr	Gly	Gly	Arg	Pro	Gly	Asp	Ala	Leu	Leu	Val	Ala	Ala	Ala	130	135	140	
Pro	Val	Leu	Ile	Leu	Ala	Gly	Thr	Val	Asn	Trp	Asp	Leu	Leu	Ala	Val	145	150	155	160
Ala	Ala	Ala	Val	Leu	Ala	Ile	Leu	Ala	Trp	Glu	Arg	Asp	Arg	Pro	Leu	165	170	175	
Leu	Ala	Gly	Val	Leu	Ile	Gly	Leu	Gly	Thr	Ala	Ala	Lys	Leu	Phe	Pro	180	185	190	
Leu	Val	Leu	Leu	Gly	Pro	Val	Leu	Leu	Leu	Cys	Leu	Arg	Gln	Arg	Arg	195	200	205	
Met	Arg	Arg	Phe	Ala	Arg	Val	Ala	Ala	Gly	Ala	Ala	Gly	Ala	Trp	Leu	210	215	220	
Leu	Val	Asn	Leu	Pro	Val	Val	Ala	Leu	Gln	Pro	Asp	Gly	Trp	Met	Glu	225	230	235	240
Phe	Trp	Arg	Phe	Asn	Ala	Gly	Arg	Gly	Ala	Glu	Phe	Gly	Ser	Leu	Trp	245	250	255	
Phe	Ala	Leu	Asp	Gly	Leu	Gly	Leu	His	Met	Pro	Ala	Val	Asn	Ala	Val	260	265	270	
Ala	Leu	Ala	Thr	Phe	Gly	Val	Leu	Leu	Ala	Gly	Ile	Ala	Val	Leu	Ala	275	280	285	

Leu Arg Ser Arg Arg Pro Pro Asp Leu Ala Gln Leu Ala Cys Leu Ala
 290 295 300
 Val Gly Ala Phe Leu Leu Thr Asn Lys Val Tyr Ser Pro Gln Tyr Ala
 305 310 315 320
 Leu Trp Leu Leu Pro Leu Val Val Ile Ala Arg Gly Arg Val Pro Arg
 325 330 335
 Trp Pro Val Val Arg Asp Trp Ala Val Trp Gln Ala Ala Glu Val Leu
 340 345 350
 Tyr Trp Leu Ala Val Trp Ser Trp Leu Ala Gly Ser Leu Thr Asp Glu
 355 360 365
 Arg Gln Tyr Ala Trp Ala Thr Val Leu Arg Val Leu Ala Thr Ala Tyr
 370 375 380
 Val Cys Gly Gln Val Val Trp Asp Val Leu Ala Ala Pro Arg Pro His
 385 390 395 400
 Arg Pro Ala Pro Pro Pro Ala Val Ala Glu Pro Ala His Pro Gly
 405 410 415

<210> 21
 <211> 491
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 21

Val Ala Ala Gln Pro Glu Glu Phe Asp Val Ile Val Val Gly Gly Gly
 1 5 10 15
 Pro Gly Gly Ser Thr Ala Ala Ala Leu Thr Ala Lys Gln Gly Ala Lys
 20 25 30
 Val Leu Leu Leu Glu Arg Glu Lys Phe Pro Arg Tyr Gln Ile Gly Glu
 35 40 45
 Ser Leu Leu Pro Ser Thr Val His Gly Val Cys Asn Leu Leu Gly Val
 50 55 60
 Gly Asp Glu Ile Ala Lys Ala Gly Phe Met Arg Lys His Gly Gly Thr
 65 70 75 80
 Phe Lys Trp Gly Thr Ser Thr Glu Pro Trp Thr Phe Thr Phe Ala Thr
 85 90 95
 Ser Pro Arg Met Ala Gly Pro Thr Ser His Ala Phe Gln Val Glu Arg
 100 105 110
 Arg Arg Phe Asp Gln Ile Leu Leu Glu Asn Ala Arg Arg Leu Gly Val

115	120	125
Asp Val Arg Glu Asn His Pro Val Thr Glu Ala Ile Ala Asp Asp Glu 130 135 140		
Arg Val Arg Gly Val Arg Phe Thr Gln Asp Gly Gln Thr Arg Thr Ala 145 150 155 160		
Leu Ala Arg Phe Val Val Asp Ala Ser Gly Asn Arg Ser Thr Leu His 165 170 175		
Thr Thr Val Gly Gly Thr Arg Glu Tyr Ser Pro Phe Phe Arg Asn Leu 180 185 190		
Ala Leu Phe Gly Tyr Phe Glu Asn Gly Arg Arg Leu Pro Ala Pro Asn 195 200 205		
Ser Gly Asn Ile Leu Cys Val Ala Phe Gly Ser Gly Trp Phe Trp Tyr 210 215 220		
Ile Pro Leu Ser Glu Thr Leu Thr Ser Val Gly Ala Val Val Arg Arg 225 230 235 240		
Glu Met Ala His Lys Val Gln Gly Asp Gln Glu Lys Ala Leu Phe Glu 245 250 255		
Leu Ile Ala Glu Cys Pro Met Ile Ala Asp Phe Leu Gly Asp Ala Thr 260 265 270		
Arg Val Thr Glu Gly Asp Tyr Gly Gln Ile Arg Val Arg Lys Asp Tyr 275 280 285		
Ser Tyr Ser Ser Thr Ser Tyr Trp Arg Pro Gly Met Cys Leu Val Gly 290 295 300		
Asp Ala Ala Cys Phe Ile Asp Pro Val Phe Ser Ser Gly Val His Leu 305 310 315 320		
Ala Thr Tyr Ser Gly Leu Leu Ala Ala Arg Ser Ile Asn Ser Val Leu 325 330 335		
Ala Gly Thr Val Asp Glu Asp Arg Ala Phe Thr Glu Phe Glu Gln Arg 340 345 350		
Tyr Arg Arg Glu Phe Gly Val Phe His Asp Phe Leu Val Ser Phe Tyr 355 360 365		
Asp Met His Val Asp Glu Ser Ser Tyr Phe Trp Ala Ala Arg Lys Val 370 375 380		
Thr Glu Ser Ser Ala Pro Ala Met Glu Ser Phe Thr Glu Leu Val Gly 385 390 395 400		
Gly Ile Ala Ser Gly Glu Asp Ala Leu Thr Gly Ser Thr Glu Leu Val 405 410 415		
Arg Arg His Ser Arg Gln Thr Ala Glu Leu Gly Gln Ala Val Ala Gly 420 425 430		
Leu Glu Glu Gly Gly Thr Gly Phe Leu Arg Gly Ser Ser Val Val Ala 435 440 445		

Gln Ala Met Phe Glu Gly Ser Gln Ile Gln Ala Gly Ala Ile Leu Gly
 450 455 460

Pro Glu Gly Thr Gln Glu Gln Pro Leu Phe Glu Gly Gly Leu Thr Pro
 465 470 475 480

Ser Gly Asn Gly Leu Thr Trp Val Ala Ala Asp
 485 490

<210> 22
 <211> 217
 <212> PRT
 <213> Actinoplanes sp.

<400> 22

Met Thr Ile Arg Val Leu Ile Ala Asp Asp Gln Ala Met Ile Arg Ser
 1 5 10 15

Gly Leu Arg Leu Ile Leu Glu Asp Glu Pro Asp Ile Glu Val Val Ala
 20 25 30

Glu Ala Val Asp Gly Val Asp Ala Val Ala Gln Ala Arg Lys Leu Arg
 35 40 45

Pro Asp Val Cys Leu Val Asp Ile Arg Met Pro Arg Ile Asp Gly Ile
 50 55 60

Glu Val Thr Arg Ser Leu Ala Gly Pro Gly Val Val Asn Pro Leu Arg
 65 70 75 80

Val Ile Val Val Thr Thr Phe Asp Ser Asp Glu Tyr Val Tyr Gly Ala
 85 90 95

Leu Arg Gly Gly Ala Val Gly Phe Ile Leu Lys Asp Ala Gly Pro Thr
 100 105 110

Leu Leu Val Glu Ala Val Arg Ala Ala His Lys Gly Asp Ala Leu Val
 115 120 125

Ser Pro Ser Val Thr Val Arg Leu Leu Asn His Leu Asn Ala Ser Ala
 130 135 140

Ala Pro Ala Gly Ser Glu Pro Ile Pro Leu Ser Asp Arg Glu Leu Glu
 145 150 155 160

Val Ala Arg Ala Ile Ala Arg Gly Arg Thr Asn Gln Glu Ile Ala Ala
 165 170 175

Asp Leu Phe Ile Ser Leu Ser Thr Val Lys Gly His Ala Ser Thr Ile
 180 185 190

Gln Ser Lys Leu Gly Val Arg Asn Arg Val Gly Val Ala Ala Trp Ala
 195 200 205

Trp Glu Asn Arg Leu Val Glu Gly Ser
 210 215

<210> 23
 <211> 403

<212> PRT
 <213> Actinoplanes sp.

<400> 23

Met Asn Ile Ala Ala Ala Thr Gly Pro Ala Ala Gly Asp Gly Ala Gly
 1 5 10 15
 Ile Arg Thr Leu Gly Ser Val Arg Thr Ala Asp Arg Thr Thr Thr Met
 20 25 30
 Val Ala Asp Ala Gly Leu Ala Val Leu Phe Val Ala Ala Val Val Val
 35 40 45
 Glu Ala Val Ala Val Ala Gln Ser Trp Gly Leu Ala Tyr Trp Leu Ile
 50 55 60
 Gly Gly Ala Ala Ala Thr Leu Val Cys Leu Leu Ala Leu Ile Arg Arg
 65 70 75 80
 Arg Gly Pro Val Pro Cys Ala Ala Ala Gly Leu Thr Ile Ala Ala Gly
 85 90 95
 Ala Val Val Thr Ala Ala Val Leu His Met Pro Ala Glu Pro Gly Pro
 100 105 110
 Ala Met Ala Leu Ala Leu Ala Val Leu Thr Gly Ser Ala Val Arg Ala
 115 120 125
 Ala Pro Thr Ile Pro Ala Phe Ala Val Gly Gly Ala Ala Leu Gly Val
 130 135 140
 Val Ala Leu Ser Gln Val Ala Ala Ala Thr Trp Asp Ala Gly Pro Ala
 145 150 155 160
 Pro Val Thr Trp Leu Asn Ile Leu Thr Trp Leu Gly Gly Thr Ala Thr
 165 170 175
 Gly Leu Ser Leu Arg Thr Val Asp Gly Arg Ala Arg Ala Asn Ala Glu
 180 185 190
 Arg Ile Arg Gln Glu Glu Arg Leu Glu Leu Ala Arg Glu Leu His Asp
 195 200 205
 Val Val Ala His His Ile Thr Gly Met Ile Leu Gln Thr Gln Ala Ala
 210 215 220
 Gln Val Leu Ala Arg Arg Asp Ala Gly Arg Val Pro Glu Arg Leu Ala
 225 230 235 240
 Val Ile Glu Thr Ala Gly Thr Glu Ala Leu Ala Ala Met Arg Arg Val
 245 250 255
 Val Gly Leu Leu Arg Asp Ala Asp Asp Gly Pro Pro Ser Ala Pro Glu
 260 265 270
 Pro Glu Glu Leu Ser Thr Leu Val Glu Arg Phe Ser Arg Gln Gly Gly
 275 280 285
 Pro Val Arg Leu Thr Thr Pro Asp Gly Met Lys Gln Trp Pro Ile Glu
 290 295 300

Val Thr Thr Thr Val Tyr Arg Ile Val Arg Glu Ala Leu Thr Asn Val
305 310 315 320

Ala Arg His Ala Pro His Ala Pro Asn Val Thr Val Thr Val Thr Val
325 330 335

Glu Gln Ala Asp Glu Ile Arg Val Glu Val Thr Asn Asp Ala Ala Ala
340 345 350

Ala Pro Pro Arg Leu His His Arg Gly Gly Tyr Gly Leu Val Gly Met
355 360 365

Arg Glu Arg Val Glu Ser Leu Gly Gly Thr Leu Ser Thr Gly Pro Arg
370 375 380

Pro Gly Gly Gly Trp Ser Val Ala Ala Thr Leu Pro Asn Pro Pro Arg
385 390 395 400

Glu Arg Arg

<210> 24

<211> 309

<212> PRT

<213> Actinoplanes sp.

<400> 24

Met Lys Ala Met Ser His Glu Arg Ser Thr Pro Val Leu Gln Ala Glu
1 5 10 15

Gly Leu Thr Lys Arg Tyr Gly Arg Arg Arg Ala Leu Thr Asp Cys Thr
20 25 30

Leu Ser Val Pro Ser Gly Arg Val Ile Ala Leu Val Gly Pro Arg Gly
35 40 45

Ser Gly Lys Ser Thr Leu Leu Gln Leu Cys Cys Gly Met Val Ala Pro
50 55 60

Ser Arg Gly Arg Ile Arg Val Leu Gly Glu Arg Pro Asp Ala Gly Ala
65 70 75 80

Ala His Leu Ala Arg Val Gly Tyr Val Pro Arg Glu Pro Ala Val Tyr
85 90 95

Gly Ser Phe Thr Val Glu Asp His Leu Thr Met Gly Ala Arg Leu Asn
100 105 110

Pro Arg Trp Asp Arg Arg Leu Ala Asp Arg Arg Ile Ala Ser Ala Gly
115 120 125

Ile Pro Arg Thr Arg Arg Ala Asp Arg Leu Ser Ala Gly Gln Arg Ala
130 135 140

Glu Leu Ala Leu Thr Leu Ala Gly Gly Lys Arg Pro Glu Leu Leu Val
145 150 155 160

Leu Asp Glu Pro Gly Ala Val Leu Asp Ala Pro Ala Arg Ala Ser Phe
165 170 175

Leu Arg Gly Val Leu Asp Phe Val Ala Glu Ile Asp Ala Ser Val Leu
180 185 190

Ile Ser Gly His Pro Ser Gly Glu Val Glu Arg Leu Cys Asp His Leu
195 200 205

Ile Val Leu Ser Asp Ser Arg Val Leu Val Ala Gly Asp Val Arg Asp
210 215 220

Leu Leu Ala Arg His His Arg Ile Ile Ala Pro Arg Gly Glu Leu Asp
225 230 235 240

Arg Leu Pro Pro Gly Met Glu Pro Ile Trp Val Glu Asp Phe Gly Ser
245 250 255

Tyr Ser Gly Gly Val Val Arg Ala Glu Val Asp Leu Pro Arg Arg Pro
260 265 270

Trp Thr Val Glu Arg Val Glu Leu Glu Glu Leu Val Leu Ser Tyr Leu
275 280 285

Ser Arg Ala Ser Gly Ala Pro Ala Leu Ala Gly Cys Leu Ile Ala Pro
290 295 300

Gly Gln Pro Gly Ser
305

<210> 25

<211> 553

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that
the biosynthesized protein will have a formylmethionine residue
at this position

<400> 25

Val Thr Ala Ala Ala Leu Glu Lys Leu Leu Gly Asp Ala Arg Asp Pro
1 5 10 15

Gly Asn Pro Val Gly Tyr Ala Ala Val Leu Ala Ala Asp Glu Arg Gln
20 25 30

Glu Met Leu Ala Glu Gly Glu Arg Leu Leu Asp Arg Tyr Gln Leu Asn
35 40 45

Ala Glu Phe Val Pro Val Ala Tyr Gly Gly Arg Leu Ala Arg Ala Asp
50 55 60

Arg Leu Ala Glu Val Leu Arg Ala Val Trp Arg Arg Asp Pro Cys Leu
65 70 75 80

Gly Leu Gly Tyr Gly Phe Ser Ser Leu Ile Ala Ser Val Asn Val Trp
85 90 95

Cys	Ala	Gly	Asn	Glu	Glu	Gln	Arg	Arg	Arg	Ala	Ala	Gly	Leu	Leu	Leu	100	105	110	
Ala	Asn	Lys	Arg	Ile	Ala	Ala	Ala	Phe	His	Glu	Leu	Ala	His	Gly	Thr	115	120	125	
Asp	Phe	Ser	Ala	Ala	Glu	Cys	Ala	Ala	Arg	Pro	Ala	Gly	Gly	Gly	Trp	130	135	140	
Val	Leu	Ser	Gly	His	Lys	Glu	Ile	Val	Thr	Asn	Leu	Arg	Arg	Ala	Glu	145	150	155	160
Ala	Met	Val	Leu	Phe	Ala	Arg	Thr	Gly	Glu	Ala	Arg	Gly	Ser	Arg	Ser	165	170	175	
His	Ser	Gln	Phe	Leu	Leu	Val	Arg	Asp	Glu	Leu	Pro	Ala	Ala	Arg	Ala	180	185	190	
Val	Asp	Arg	Pro	Arg	Tyr	Pro	Gly	Ser	Gly	Met	Arg	Gly	Ile	Asp	Leu	195	200	205	
Gly	Gly	Leu	Val	Phe	Asp	Asp	Cys	Pro	Val	Pro	Ser	Ser	Ala	Leu	Leu	210	215	220	
Gly	Glu	Gln	Gly	His	Gly	Ile	Glu	Val	Ala	Leu	Arg	Ala	Tyr	Gln	Val	225	230	235	240
Thr	Arg	Met	Val	Ser	Pro	Ala	Leu	Leu	Val	Gly	Pro	Leu	Asp	Ser	Ala	245	250	255	
Val	Arg	Leu	Ala	Thr	Glu	Met	Ala	Met	Glu	Arg	Arg	Leu	Tyr	Gly	Ala	260	265	270	
Ala	Val	Ala	Asp	Leu	Pro	Tyr	Val	Arg	Thr	Thr	Ile	Ala	Arg	Ala	Tyr	275	280	285	
Ala	Ala	Leu	Leu	Thr	Val	Asp	Val	Phe	Ser	Gly	Val	Gly	Leu	Arg	Ala	290	295	300	
Leu	His	Leu	Leu	Pro	Glu	Ala	Thr	Ala	Gly	Tyr	Ala	Pro	Ala	Val	Lys	305	310	315	320
Tyr	Leu	Thr	Ala	Gln	Ile	Val	Leu	Asp	Ala	Ile	Asp	Asp	Leu	Arg	Ser	325	330	335	
Val	Leu	Gly	Ala	Gln	Gly	Tyr	Leu	Arg	Gln	Gly	Pro	Tyr	Ala	Met	Phe	340	345	350	
Gln	Lys	Leu	Val	Arg	Asp	Ala	Ala	Pro	Ala	Ser	Phe	Ala	His	Val	Ser	355	360	365	
Arg	Ala	Ala	Cys	Leu	Val	Met	Leu	Leu	Pro	His	Leu	Pro	Arg	Leu	Ala	370	375	380	
Arg	Arg	Ser	Trp	Thr	Ala	Glu	Glu	Pro	Pro	Pro	Asp	Asn	Val	Phe	Thr	385	390	395	400
Leu	Gly	Gly	Glu	Leu	Ser	Pro	Leu	Asp	Phe	Ser	Arg	Leu	Val	Ser	Gly	405	410	415	
Met	Arg	Gly	Asp	Pro	Leu	Ala	Gly	Val	Leu	His	Asp	Ser	Trp	His	Asp				

145		150		155		160
Ala Arg Tyr Leu Thr Val Leu Ala Arg Thr Gly Arg Ala Gly Asp Ala						
	165			170		175
Arg Gly Gln Ser Leu Phe Leu Val Asp Lys Glu Ala Leu Ala Pro Gly						
	180		185			190
Thr Trp Leu Pro Arg Pro Lys Val Ala Thr His Gly Val Arg Gly Ile						
	195		200		205	
Asp Ile Ser Gly Ile Ala Phe Glu Asp Ala Gly Leu Pro Gly Thr Ala						
	210		215		220	
Leu Leu Gly Arg Ala Gly Ser Gly Leu Glu Thr Val Leu Arg Ser Leu						
	225		230		235	240
Gln Leu Thr Arg Thr Met Cys Ala Gly Leu Ser Leu Gly Ala Gly Asp						
		245		250		255
Arg Ala Leu Arg Leu Thr Ala Arg Phe Val Ala Gln Arg Met Ile Met						
	260		265			270
Arg Arg Pro Leu Leu Asp Arg Gly His Pro Ala Gly Ile Leu Ala Arg						
	275		280		285	
Cys Ala Ala Leu Leu Ala Ala Ala Glu Ala Thr Ala Val Val Gly Thr						
	290		295		300	
Arg Ser Val His Ser Leu Thr Ala Glu Met Ser Val Thr Ser Ala Ile						
	305		310		315	320
Val Lys Ala Tyr Val Pro Thr Val Val Asp Arg Val Leu Arg Glu Leu						
		325		330		335
Ala Glu Leu Leu Gly Ser Arg Ser Phe Leu Arg Asp Glu Tyr Glu His						
	340		345			350
Gly Met Phe Pro Lys Leu Val Arg Asp His His Val Val Ala Val Phe						
	355		360			365
Asp Gly Ser Thr Pro Val Val Arg Thr Ala Leu Ala His Gln Phe Pro						
	370		375		380	
Arg Leu Ala Ala Gly Phe Ala Ala Gly Ala Val Ser Ala Glu Gly Leu						
	385		390		395	400
Ala Glu Ala Ser Ala Ala Gly Gln Pro Pro Pro Pro Leu Asp Arg Gly						
		405		410		415
Ala Leu Thr Leu Leu Ser Arg His Gly Cys Ser Val Val Gln Ala Leu						
	420		425			430
Pro Ala Leu Ala Val Ser Ala Ala Val Arg Gly Gly Pro Ala Gly Leu						
	435		440		445	
Ala Arg His Ala Ala Ala Leu Ala Gly Glu Ala Arg Arg Ile Cys Gly						
	450		455		460	
Gln Met Thr Glu Leu Gly Pro Ser Ala Arg Pro Ser Met Val Gly His						
	465		470		475	480

Glu Leu Ala Ala Ala Tyr Glu Trp Cys Tyr Ala Gly Ala Ala Cys Leu
 485 490 495
 Leu Leu Trp Thr Ser Ala Glu Gly Arg His Thr Ala Asp Pro Leu Trp
 500 505 510
 Ala Asp Gly Leu Trp Val Leu Ala Ala Leu Arg Ala Val Arg Arg Glu
 515 520 525
 Leu Ala Arg Val Leu Arg Ala Pro Ala Pro Asp Pro Gly Pro His Asp
 530 535 540
 Asp Gly Ala Asp Arg Leu Leu Ala Ala Arg Val Ala Ala Ala Ala Arg
 545 550 555 560
 Thr Gly Glu Pro Val Thr Pro Phe Gly Thr Ala Leu Arg Pro Pro Ala
 565 570 575
 Gly Thr Val Arg Ala Glu Asp Gly Arg
 580 585

<210> 27
 <211> 587
 <212> PRT
 <213> Actinoplanes sp.

<400> 27

Met Val Ile Asp Ala Ala Thr Gln Pro Thr Val Pro Asp Ala Phe Arg
 1 5 10 15
 Ala Gln Ala Ile Ala Arg Pro Gly Glu Pro Ala Leu Val Val Leu Pro
 20 25 30
 Gly Asp Pro Asp Ala Glu Pro Val Thr Leu Thr Tyr Ala Glu Leu Asp
 35 40 45
 Arg Arg Ala Ala Ala Arg Ala Ala Trp Leu Ala Ala Arg Phe Pro Ala
 50 55 60
 Gly Glu Arg Ile Leu Ile Ala Leu Pro Thr Gly Ala Glu Phe Val Glu
 65 70 75 80
 Leu Tyr Leu Ala Cys Leu Tyr Ala Gly Leu Val Ala Val Pro Ala Pro
 85 90 95
 Pro Pro Gly Gly Ser Ser Gly Ala Ser Glu Arg Thr Val Gly Ile Ala
 100 105 110
 Ala Asp Cys Ser Pro Ala Leu Ala Val Val Asn Ala Asp Asp Ala Ala
 115 120 125
 Pro Leu Thr Ala Val Leu Arg Glu Arg Gly Leu Ser Gly Leu Pro Val
 130 135 140
 Gly Ala Leu Pro Pro Leu Ala Ala Glu Ala Ile Arg Pro Pro Arg Gly
 145 150 155 160
 Pro Arg Pro Asp Ser Leu Ala Val Leu Gln Tyr Ser Ser Gly Ser Thr
 165 170 175

Gly Ser Pro Lys Gly Val Met Leu Ser His Arg Ala Val Leu Ala Asn
 180 185 190
 Leu Arg Ala Phe Asp Arg Ser Ser Gly His Asn Ser Asp Asp Val Phe
 195 200 205
 Gly Ser Trp Leu Pro Leu His His Asp Met Gly Leu Phe Ala Met Leu
 210 215 220
 Thr Ala Gly Leu Leu Asn Gly Ala Gly Val Val Leu Met Ser Pro Thr
 225 230 235 240
 Ala Phe Val Arg Arg Pro Ala Asp Trp Leu Arg Met Met Asp Arg Tyr
 245 250 255
 Arg Val Thr Ile Ser Ala Ala Pro Asn Phe Ala Tyr Asp Leu Cys Val
 260 265 270
 Arg Ala Val Arg Asp Glu Gln Ile Ala Gly Leu Asp Leu Ser Arg Ile
 275 280 285
 Arg Thr Leu Tyr Asn Gly Ser Glu Pro Val Asn Pro Ala Thr Val Arg
 290 295 300
 Ala Phe Thr Glu Arg Phe Ala Pro Phe Gly Leu His Thr His Ala Val
 305 310 315 320
 Asn Pro Cys Tyr Gly Met Ala Glu Phe Thr Ala Tyr Val Ser Thr Lys
 325 330 335
 Val Phe Glu Ala Pro Ala Val Phe Leu Pro Ala Asp Pro Arg Ala Leu
 340 345 350
 Glu Asp Ala Ala Ser Pro Ala Leu Arg Pro Ala Asp Pro Ala Ala Ala
 355 360 365
 Arg Glu Ile Pro Gly Val Gly Arg Val Pro Asp Phe Glu Val Leu Ile
 370 375 380
 Val Asp Pro Asp Gly Leu Arg Pro Leu Pro Glu Gly Arg Val Gly Glu
 385 390 395 400
 Ile Trp Leu Arg Gly Pro Gly Ala Gly Ala Gly Tyr Trp Gly Arg Thr
 405 410 415
 Glu Leu Asn Pro Gly Ile Phe Asp Ala Arg Pro Ala Gly Asp Gly Gln
 420 425 430
 Asp Gly Gly Trp Val Arg Thr Gly Asp Leu Gly Ala Leu Thr Gly Gly
 435 440 445
 Glu Leu Phe Leu Thr Gly Arg Leu Lys Glu Leu Leu Ile Val His Gly
 450 455 460
 Arg Asn Leu Ala Pro His Asp Leu Glu Arg Glu Ala Arg Ala Ala His
 465 470 475 480
 Asp Ala Val Asp His Gln Ile Gly Ala Ala Phe Gly Val Pro Ala Pro
 485 490 495

Asp Glu Arg Ile Val Leu Val Gln Glu Val His Pro Arg Thr Pro Leu
 500 505 510
 Asp Glu Leu Pro Arg Val Ala Ser Ala Val Ser Arg Arg Leu Thr Val
 515 520 525
 Ser Phe Gly Val Pro Val Arg Asn Val Leu Leu Val Arg Arg Gly Thr
 530 535 540
 Val Arg Arg Thr Thr Ser Gly Lys Ile Arg Arg Thr Ala Val Arg Glu
 545 550 555 560
 Arg Phe Leu Ala Gly Gly Ile Thr Ala Leu His Ala Glu Leu Glu Pro
 565 570 575
 Ala Leu Arg Pro Val Gln Ala Gly Ala Gly Arg
 580 585

<210> 28
 <211> 75
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. Ti is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 28

Val Pro Asn Pro Phe Glu Asp Pro Asp Ala Asn Tyr Leu Val Leu Val
 1 5 10 15
 Asn Asp Glu Gly Gln His Ser Leu Trp Pro Val Phe Ala Asp Val Pro
 20 25 30
 Asp Gly Trp Thr Thr Val Phe Gly Glu Ala Gly Arg Gln Asp Cys Leu
 35 40 45
 Asp Tyr Ile Glu Lys Ser Trp Thr Asp Met Arg Pro Lys Ser Leu Ile
 50 55 60
 Ala Ala Met Glu Lys Gln Lys Gln Pro Gln Ser
 65 70 75

<210> 29
 <211> 94
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V is a non-standard initiator codon. It is expected that the bio
 synthesized protein will have a formylmethionine residue at this
 position

<400> 29

Val Ala Pro Gly Ala Pro Pro Ala Glu His Gly Glu Ala Val Pro Glu
1 5 10 15

Ala Asp Ile Pro Val Leu Arg Asn Arg Ile Asp Glu Ile Asp Ala Ala
20 25 30

Ile Met Arg Leu Trp Gln Glu Arg Ala Ser Ile Ser Gln Lys Ile Gly
35 40 45

Ser Ile Arg Leu Ala Ser Gly Gly Thr Arg Val Val Leu Ser Arg Glu
50 55 60

Gln Glu Val Ile Gln Arg Phe Arg Ala Ala Leu Gly Glu Asp Gly Thr
65 70 75 80

Thr Ile Ala Leu Met Leu Leu Arg Ala Gly Arg Gly Pro Leu
85 90

<210> 30

<211> 619

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that
the biosynthesized protein will have a formylmethionine residue
at this position

<400> 30

Val Asp Val Pro Arg Val Arg Pro Pro Gly Ala Ala Pro Ala Pro Arg
1 5 10 15

Arg Arg Arg Trp Arg Phe Trp Gln Ser Pro Asp Gly Gln Pro Ala Trp
20 25 30

Ala Arg Pro Ala Leu Leu Gly Ile Ala Ala Leu Ala Ala Val Leu Tyr
35 40 45

Thr Ala Asn Leu Ala Arg Ser Gly Tyr Pro Met Tyr Tyr Ala Val Ala
50 55 60

Val Lys Ser Met Ser Val Ser Trp Pro Ala Phe Trp Thr Gly Ala Phe
65 70 75 80

Asp Pro Ala Ala Ser Ile Thr Ile Asp Lys Leu Ala Gly Ala Phe Val
85 90 95

Pro Gln Ala Leu Ser Ala Arg Val Phe Gly Phe His Gln Trp Ser Leu
100 105 110

Ala Leu Pro Gln Ala Val Glu Gly Val Ile Ala Val Leu Val Leu Tyr
115 120 125

Arg Ala Val Arg Arg Trp His Gly Pro Gly Ala Gly Leu Ala Ala Ala
130 135 140

Gly Leu Phe Ala Thr Thr Pro Ile Val Ser Ser Met Phe Gly His Ser
 145 150 155 160
 Met Glu Asp Gly Ala Leu Thr Leu Cys Leu Val Leu Ala Ala Asp Ala
 165 170 175
 Phe Gly Ala Ala Val Thr Arg Gly Ser Pro Ala Arg Leu Ala Leu Ala
 180 185 190
 Gly Ala Trp Ile Gly Leu Gly Phe Gln Ala Lys Met Met Gln Ala Trp
 195 200 205
 Leu Val Leu Pro Ala Leu Val Val Thr Tyr Leu Ala Gly Ala Pro Val
 210 215 220
 Arg Ala Arg Ala Arg Val Val His Val Ala Ala Ala Val Ala Ala Thr
 225 230 235 240
 Leu Ala Val Ser Leu Leu Trp Val Leu Ala Leu Thr Leu Leu Pro Gly
 245 250 255
 Ser His Arg Pro Trp Ala Asp Gly Thr Thr Ser Gly Asn Ala Phe Ala
 260 265 270
 Met Val Phe Gly Tyr Asn Gly Phe Asp Arg Ala Gly Ile His Val Pro
 275 280 285
 Gly Ala Leu Thr Thr Gly Phe Thr Asp Gly Gly Ala Ala Ala Gly Gly
 290 295 300
 Ser Trp Thr Ala Leu Ala Ala Asp Arg Leu Ala Thr Gln Ile Gly Trp
 305 310 315 320
 Trp Tyr Pro Leu Ala Leu Thr Gly Leu Leu Leu Gly Leu Ala Arg Trp
 325 330 335
 Arg Thr Ala Arg Ala Gly Leu Leu Phe Trp Gly Leu Trp Leu Leu Thr
 340 345 350
 Ala Ala Val Val Leu Ser Arg Ile Thr Ile Gln His Asn Ala Tyr Leu
 355 360 365
 Ala Val Leu Ala Pro Pro Leu Ala Ala Leu Ala Ala Gly Ala Val
 370 375 380
 Gln Leu Trp Arg Thr His Arg Asp Gly Thr Ala Pro Trp Leu Leu Pro
 385 390 395 400
 Ala Val Val Val Val Gln Ala Gly Trp Thr Leu Trp Leu Ala Thr Arg
 405 410 415
 Tyr Pro Ser Phe Leu Ala Gly Leu Thr Trp Thr Ala Pro Ile Ala Ala
 420 425 430
 Val Leu Ala Val Val Val Leu Ala Ala Arg Pro Thr Ala Arg Arg Pro
 435 440 445
 Ala Val Val Val Val Val Ala Gly Leu Leu Ala Val Pro Val Ala Trp
 450 455 460

Gly Ala Ser Val Leu Asn Pro Arg Tyr Ala Gly Thr Ser Phe Glu Ala
465 470 475 480

Gly Ala Gly Pro Ser Gly Pro Val Gly Val Arg Leu Asp Asp Asp Thr
485 490 495

Thr Asp Arg Leu Thr Pro Gly Leu Arg Arg Leu Asp Asp Tyr Leu Ala
500 505 510

Ala His Arg Asp Gly Arg Thr Tyr Leu Ala Ala Thr Ser Ser Trp Arg
515 520 525

Thr Ala Gly Arg Leu Ile Val Pro Thr Gly His Ser Tyr Leu Pro Leu
530 535 540

Gly Gly Phe Ser Gly Ala Ala Pro Phe Pro Ser Leu Ala Gly Val Gln
545 550 555 560

Arg Leu Val Arg Asp Gly Glu Leu Arg Tyr Phe Val Leu Gly Gly Pro
565 570 575

Glu Gly Leu Gly Gly Glu Ala Thr Glu Ala Tyr Arg Ile Thr Gly Trp
580 585 590

Val Leu Glu Thr Cys Ala Thr Val Pro Pro Ala Glu His Gly Ala Asp
595 600 605

Pro Asp Leu Thr Val Leu Arg Cys Asp Lys Pro
610 615

<210> 31

<211> 355

<212> PRT

<213> Actinoplanes sp.

<220>

<221> misc_feature

<222> (1)..(1)

<223> V represents a non-standard initiator codon. It is expected that the biosynthesized protein will have a formylmethionine residue at this position

<400> 31

Val Asp Asn Gly Thr Phe Thr Asp Leu Arg Ile Asp His Ile Glu Phe
1 5 10 15

Ala Val Ala Asp Val Glu Ser Ala Ser Ala Pro Phe Thr Glu Gly Tyr
20 25 30

Gly Phe Ser Val Tyr Gly Gly Thr Gly Asp Ala His Ala Pro Val Arg
35 40 45

Arg Val Ala Leu Gly Arg Asp Asp Ile Arg Leu Val Leu Thr Ala Ala
50 55 60

Pro Gly Gly Asp His Pro Ala Met Ala Tyr Val Glu Gln His Gly Asp
65 70 75 80

Gly Val Ser Ala Ile Ala Leu Ser Thr Arg Asp Ala His Ala Ala Phe

				85				90				95			
Thr	Glu	Ala	Val	Arg	Arg	Gly	Ala	Val	Gly	Val	Ser	Ala	Pro	Val	Thr
			100					105						110	
Gly	Asn	Gly	Val	Thr	Val	Ala	Thr	Ile	Arg	Gly	Phe	Gly	Asp	Val	Leu
			115				120				125				
His	Thr	Phe	Val	Glu	Arg	Ala	Pro	Gly	Ala	Asp	Pro	Arg	Thr	Leu	Pro
			130				135				140				
Gly	Leu	Glu	Leu	Arg	Arg	Pro	Ser	Pro	Thr	Arg	Phe	Asp	Ser	Gly	Leu
145				150				155						160	
Gln	Ala	Ile	Asp	His	Ile	Ala	Val	Cys	Leu	Glu	Pro	Gly	Thr	Leu	Asp
			165					170						175	
Pro	Thr	Val	Asp	Phe	Tyr	Arg	Asp	Val	Leu	Asp	Phe	Glu	Met	Ile	Phe
			180				185				190				
Glu	Glu	Arg	Ile	Leu	Val	Gly	Arg	Gln	Ala	Met	Asp	Ser	Lys	Val	Val
			195				200				205				
Gln	Ser	Arg	Ser	Gly	Gly	Val	Thr	Leu	Thr	Leu	Ile	Glu	Pro	Asp	Thr
			210	215				220							
Ser	Leu	Glu	Gln	Gly	Gln	Ile	Asp	Thr	Phe	Leu	Lys	Asn	His	Gly	Gly
225				230				235						240	
Pro	Gly	Val	Gln	His	Leu	Ala	Phe	Ile	Thr	Asp	Asp	Val	Leu	Arg	Ser
			245					250						255	
Val	Gly	Arg	Met	Ser	Glu	His	Gly	Val	Glu	Phe	Leu	His	Thr	Pro	Asp
			260				265				270				
Ser	Tyr	Tyr	Gly	Arg	Leu	Pro	Gly	Arg	Ile	Pro	Gln	Ala	Gly	His	Pro
			275				280				285				
Ile	Gln	Ala	Leu	Arg	Asp	Leu	Asn	Val	Leu	Val	Asp	Gln	Asp	His	Asp
			290	295				300							
Gly	Gln	Leu	Phe	Gln	Ile	Phe	Thr	Lys	Ser	Val	His	Pro	Arg	Gly	Thr
305				310				315						320	
Ile	Phe	Met	Glu	Val	Ile	Glu	Arg	Met	Gly	Ala	Arg	Ser	Phe	Gly	Ser
			325					330						335	
Gly	Asn	Ile	Lys	Ala	Leu	Tyr	Glu	Ala	Val	Glu	Leu	Asp	Met	Ser	Lys
			340				345				350				

Gln Ser Ala
355

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<210> 32
<211> 429
<212> PRT
<213> Actinoplanes sp.
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<400> 32

Met Glu Ser Pro Ala Thr His Ala Glu Leu Val Ile Gly Thr Val Leu

1	5	10	15
Leu Asp Ile Ala Leu Val Leu Ala Ala Gly Ala Leu Leu Gly Arg Trp	20	25	30
Val Arg Arg Leu Arg Gln Pro Ala Val Ile Gly Glu Ile Leu Ala Gly	35	40	45
Ile Ala Leu Gly Pro Ser Leu Leu Gly Leu Leu Pro Gly Asn Pro Thr	50	55	60
Ala Trp Leu Phe Pro Ala Glu Ala Arg Pro Tyr Leu Ser Ala Val Ala	65	70	80
Gln Ile Gly Leu Ala Leu Phe Thr Phe Leu Ile Gly Trp Glu Phe Asn	85	90	95
Pro Ala Thr Leu Ala Arg His Arg Gly Thr Ala Ala Ala Val Ser Ile	100	105	110
Gly Ser Ile Ala Val Ser Phe Gly Leu Gly Ile Ala Leu Ala Thr Val	115	120	125
Leu His Pro Arg His Asp Thr Thr Gly Gly Gly Lys Val Gly Phe Thr	130	135	140
Glu Phe Ala Leu Phe Leu Gly Val Ala Met Ser Ile Thr Ala Phe Pro	145	150	155
Val Leu Ala Arg Ile Leu Ala Glu Arg Arg Leu Thr Gly Thr Arg Val	165	170	175
Gly Ser Ile Ala Leu Val Ser Ala Ala Ile Asp Asp Val Val Ala Trp	180	185	190
Cys Leu Leu Ala Leu Val Thr Ala Ile Ala Thr Ala Ser Gly Pro Val	195	200	205
Gln Leu Val Arg Ile Leu Ala Leu Leu Ala Val Phe Leu Val Val Leu	210	215	220
Val Thr Val Val Arg Pro Leu Leu Val Leu Leu Ala Arg Arg Pro Ser	225	230	235
Ala Ser Tyr Leu Leu Val Ala Val Val Ala Val Val Leu Leu Ser Ala	245	250	255
Tyr Ala Thr Thr Trp Ile Gly Leu His Ala Ile Phe Gly Ala Phe Cys	260	265	270
Ala Gly Leu Val Met Pro Arg Glu Pro Ala Ala Ala Leu Arg Glu Arg	275	280	285
Val Arg Gln Pro Leu Glu His Val Ser Val Val Leu Leu Pro Val Phe	290	295	300
Phe Ile Val Thr Gly Leu Gly Val Asp Ile Gly Ala Leu Thr Ala Ala	305	310	315
Asn Ile Leu Glu Leu Ala Ala Ile Ile Val Ile Ala Cys Ala Gly Lys	325	330	335

Leu Ala Gly Ala Ile Val Pro Ala Val Ser Leu Gly Met Ser Trp Arg
 340 345 350
 Asp Ala Arg Thr Leu Gly Leu Leu Val Asn Thr Arg Gly Leu Thr Glu
 355 360 365
 Leu Val Val Leu Asn Val Gly Leu Gln Leu Ala Val Leu Asp Gly Gln
 370 375 380
 Met Phe Thr Met Met Val Leu Met Ala Leu Val Thr Thr Ala Leu Ala
 385 390 395 400
 Gly Pro Leu Ile Gly Ser Ala Arg Thr Pro Ala Ala Gly Ala Pro Ala
 405 410 415
 Gln Ala Leu Pro Ala Glu Pro Arg Thr Arg Arg Ala Ala
 420 425

<210> 33
 <211> 189
 <212> PRT
 <213> Actinoplanes sp.
 <220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 33

Val Ser Asp Glu Ala Ala Val Pro Ser Pro Ala Arg Leu Leu Arg Asp
 1 5 10 15
 Phe Val Asn Thr Tyr Glu Pro Gln Val Asp Asp Glu Ser Leu Ser Thr
 20 25 30
 Pro Asp Ala Leu Arg Ala Trp Leu Ala Gly Glu Ser Leu Leu Ala Pro
 35 40 45
 Gly Ala Arg Val Arg Pro Ala Asp Leu Ala Arg Ala Val Ala Leu Arg
 50 55 60
 Glu Gly Leu Arg Gln Val Leu Leu Gly His Ala Gly His Pro Ala Asp
 65 70 75 80
 Pro Ala Ala Leu Arg Arg Leu Glu Glu Ile Leu Ala Ala Val Pro Val
 85 90 95
 Arg Leu Ser Leu Ala Gly Gly Ala Pro Arg Leu Leu Pro Ala Gly Gly
 100 105 110
 Thr Pro Phe Asp Arg Ala Leu Ala Gly Leu Ile Asp Ala Val Arg Gln
 115 120 125
 Cys Ala Glu Leu Gln Val Trp Thr Arg Leu Lys Val Cys Asp Arg Asp
 130 135 140

Thr Cys Arg Trp Ala Tyr Tyr Asp Ala Ser Arg Asn Gln Ala Arg Arg
 145 150 155 160

Trp Cys Ser Met Ala Gly Cys Gly Asn Tyr Ile Lys Met Arg Arg Ala
 165 170 175

Tyr Ala Ala Arg Arg Val Arg Gly Ser Ala Gly Ser Ala
 180 185

<210> 34
 <211> 309
 <212> PRT
 <213> Actinoplanes sp.

<220>
 <221> misc_feature
 <222> (1)..(1)
 <223> V represents a non-standard initiator codon. It is expected that
 the biosynthesized protein will have a formylmethionine residue
 at this position

<400> 34

Val Ala Thr Thr Leu Arg Asp Val Ala Arg Leu Ala Arg Val Ser Val
 1 5 10 15

Lys Thr Val Ser Asn Val Val Asn Asp His Pro His Val Ser Asp Asp
 20 25 30

Val Arg Arg Arg Val Glu Thr Ala Ile Arg Gln Leu Gly Tyr Arg Pro
 35 40 45

Asn Leu Val Ala Arg Ala Leu Arg Ser Gly Arg Gly Ser Gly Leu Leu
 50 55 60

Ala Leu Ala Met Pro Gly Ala Gly Ala Pro Gln Ser Pro Ala Leu Ile
 65 70 75 80

Glu Glu Ile Ile Arg Arg Ala Ala Pro Leu Gly Phe Arg Val Leu Ile
 85 90 95

Glu Pro Leu Glu Ser Ser Arg Pro Arg Pro Pro Ala Pro Gly Val Asp
 100 105 110

Ala Arg Leu Leu Asn Ala Glu Ala Pro Ala Pro Glu Leu Val Asp Ala
 115 120 125

Gln Ala Ala Thr Gly Thr Pro Leu Val Leu Leu Thr Gly Thr Pro Asp
 130 135 140

Pro Arg Tyr Asp Cys Val Gly Pro Asp Ala Ala Arg Ala Ala Glu Asp
 145 150 155 160

Ala Val Asp His Leu Arg Arg Leu Gly Arg Arg Arg Val Ala Thr Ile
 165 170 175

Gly Gly Ser Leu Ser Thr Gly Pro Ala Gly Ser Gly Ser Asp Phe Gly
 180 185 190

Ser Gly Ser Gly Ser Gly Ser Gly Ser Gly Ser Gly Ser Gly

